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September 14, 1959

Aviation Week

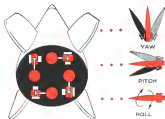
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(續) 表 2 的數據顯示

AVIATION CALENDAR

(Continued from page 5)

J. Operations Conference (Joint) Days,
days Service N.Y. State Department of
Military New York State Department of
Commerce

Oct. 5-11th Annual Meeting, National Business Aircraft Ass., Hotel Lexington Inn, Minneapolis, Minn.

Oct. 6-8-Radio Interference Reduction and Electronic Compatibility Conference. Veterans of Science and Industry, Chicago, IL. Conducted by Army Research Installation in cooperation with Institute of Radio Engineers' Professional Group on Radio Frequency Interference. (Classified version on Oct. 8.)

Oct. 6-8—National Airport Conference: Various Ohio State University American Univ. of Airport Facilitation and the University of Oklahoma in cooperation with FAA.

Oct. 4-5—Industry Matters: Dallas, Coastal
Museum and Seaport, Oklahoma City
See National Assn. Timber MFG. Club
Boone City, Okla.

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OUT 78—Second Advanced Propulsion Systems Symposium, New England Nuclear, 1001 Boston Mass. Sponsored by First Office of Scientific Research, Navy.

Event Search Laboratory
Oct. 7-9, North Atlantic Symposium on
Human Technology, American Nuclear
Society, Meriden Hotel, Philadelphia, Pa.

Oct. 7-12: Fourth Annual National Voting, Air Traffic Control Assn. Ballroom, Hotel Oklahoma City, Okla.

Oct. 5-15—Society of Experimental Test Pilot's Symposium on Pilot's Role in Space Evaluation, Beardsley Hilton Hotel.

Oct. 21-26—Third Pacific Area Natural
Meeting, American Society for Testing

Oct 13-14—Fall General Meeting, American Institute of Herbivore Pigeons, Hotel Monterey, Chicago, Ill.

Oct. 12-14-14th Annual National Convention and Legislative Forum National Ex. Line Transportation Ass., Olympic Hts. & Seaside, Wash.

Oct. 12-14—Annual Meeting, National Association of State Aviation Officials, Mark Hopkins Hotel, San Francisco, Calif.
Oct. 12-16—19th National Electronics Con-

Oct. 12-18-1976 Annual General Meeting
of the International Air Transport Association
Imperial Hotel, Tokyo, Japan

Oct. 12-16—NASS's 1999 Superstorm Long
Is Research Center, Houshoo, Va
Oct. 14-21—William T.E. II, beyond
Wash/Wide Interceptor Weapons Meet
2-10-2000, Boston, Mass.

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AVIATION WEEK, September 14, 1959



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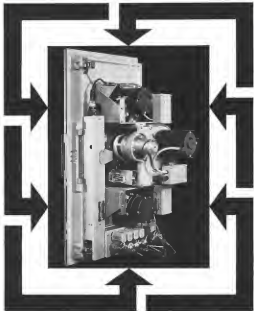
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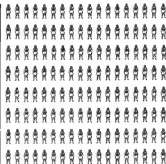
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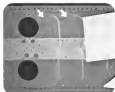
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EDITORIAL

Growing Pressure for Real Unification

The growing congressional pressure for drastic action in the Defense Department to unify the military services and fit them into truly national strategic planning (AW Sept. 7, p. 30) is a serious symptom of rising public dissatisfaction with the way in which the Pentagon is being run. It is becoming more and more evident with the passing of each \$39 billion military appropriations bill followed by the Pentagon screams of "not enough," and the passing of each bitter and unresolved inter-service row over weapons, roles and missions, that the present organizational structure of the Defense Department is utterly inadequate to do the job the people of this country require from it within the bounds of reasonable costs.

This inadequacy has been recognized during the past several years by everybody from President Eisenhower down. His Defense Department reorganization plan of 1958 was certainly a step in the right direction, but events have proved that there has been little real action in the Pentagon to execute its intent. The growing public dissatisfaction and congressional clamor are indications that nothing short of a fundamental overhaul of the Defense Department structure will achieve any significant results.

Growing Bureaucracy

For some time, the basic approach to the swirling area of the three military services to solve their military conflicts at the Joint Chiefs of Staff level has been to employ a continually growing layer of civilian bureaucracy in the Office of the Secretary of Defense with the alleged task of making the decisions the military were unwilling or unable to make. After several years of watching this bureaucracy in action, it is apparent that free too are developing the traditional decision-making process to produce modern military effectiveness within the bounds of reasonable economy.

Even with the additional green provided by President Eisenhower's reorganization plan, Defense Secretary Neil McElroy has consistently demonstrated his unwillingness to make these decisions and has urged Congress to "hold our feet to the fire" to force the Defense Department into making decisions on such billion dollar weapons system programs. Under the present operation of the Defense Department, a larger defense budget would be no guarantee of increased military effectiveness.

What has been happening under the present system is that the three military services have been cooperating bitterly to the major disadvantage of whatever happens to be the top priority and most glamorous military mission of the moment and national commands the most funds. Both the Navy and the Army made vigorous efforts to get into the strategic bombardment mission of the Air Force at a cost of billions of wasted taxpayers' money without one shot of successful military effectiveness.

All three services are now scrambling madly for a major

role in the space program, with the Advanced Research Projects Agency as another complication in the picture. There is still no truly effective coordination between the agencies of the National Aeronautics and Space Administration and the Pentagon on military space applications and too much of what is already an overly modest budget for this effort is being dissipated in this organizational void.

Military Spotlight

In the meantime, Army, Navy and Air Force are all engulging vital but less glamorous functions to keep their place in the military spotlight. The Navy has neglected its anti-submarine mission and this capability is now probably the weakest link in the U. S. defense chain. The Army has done extremely little about developing an interoperable units of tremendous firepower required for either battlefield wars or in the secondary phase of nuclear war. The Air Force has treated its airlift mission and air defense as unexciting relatives in allocating its resources.

It is obvious to any observer who has traveled extensively at the operational level of the military services, that unification and effective cooperation are major problems at the working levels. It is only in the Pentagon, where the money, power and glory are dispensed, that the color of a mission becomes a matter of overriding concern and a loss of military effectiveness and waste of taxpayers' dollars does not appear to be too high a price to pay for pocketing an individual into strategic positions.

Organization Obsolete

Modern technology has made our land, sea and air organization of the military as obsolete as the long bow and so far we have made precious little progress in changing our defense structure to meet the challenges of the present, much less plan wisely for the future. Our money, manpower and scientific and industrial capacity will not prove equal to the tasks ahead unless a more realistic and efficient defense organization is designed.

The tide of public opinion has been rising steadily on this issue for the past decade as millions of citizens' soldiers reflected on their experience in World War II and Korea. The spectacular rise of Soviet military technology during the past five years and the initial achievements of Soviet space science have made the need for military reform more acute.

If we cannot channel the vast talent of our national resources into an effective military, political and economic effort to meet the presently growing challenge of Soviet imperialism, we cannot face the grueling tests ahead with much hope for success.

—Robert Hottel



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WHO'S WHERE

In the Front Office

Baker Research and Development Laboratories, Inc., Woonsocket, N. Y., a subsidiary of Perkin-Elmer Corp., Inc., has made the following executives its directors: Dr. Theodore K. Stahk, Oscar B. Riedinger, R. John J. Carpenter, William O. Bennett, Daniel C. Standaugh, Jeff E. Flack, Maurice J. Lee, president, Raytheon Corp. Norwalk, Conn., according to Ben DeLoe on local channels.

Donald A. McFarley, president of Visteon Research Corp.'s truck segment subsidiary, 3501 Main St., Los Angeles, Calif. D. A. Bennett, president of the Tinsley Radio Division Co., Carle Place, Ohio, according to William E. Dunsford, who will continue as a director and chairman of the corporate committee. H. E. McFarley will coach Mr. Bennett in executive vice president.

R. D. Moss, vice president customer operations, Lockheed Aircraft Systems, Inc., Gillette, Calif.

Dr. Donald G. Wilson, executive vice president, Battelle Research Station, Dayton, Ohio, a division of Battelle Memorial Corp., Richwood, N. Y. Wilson G. Allen, male succeeds Dr. Wilson as general manager of Scientific-Cardiac (San Diego), San Diego, Calif.

Jack G. Anderson, vice president and general manager, Helman Laboratories Division, Hallam Electronics Corp., Los Angeles, Calif. John Wheeler, vice president and general manager, National Electronic Corp., Van Nuys, Calif.

Arnold W. Finkbein, director of the National Aeronautics and Space Administration's Office of International Programs, Washington, D. C.

Honors and Elections

Thomas M. Lawless, manager of the Research Operations Department at General Electric's Research Laboratory, has been named a member of the National Research Council, an affiliate of the National Academies of Sciences, Washington, D. C.

Dr. Knox Mitchell, Air Force Missile Development Center Chief Scientist, has been awarded the Exceptional Orders Service Award for his outstanding contributions to Air Force research and development projects.

Changes

Thomas E. Wilson, assistant engineering manager and Donald G. Riedinger, chief of Space, Reaction, Simulation, Division of Douglas Aircraft Corp., Warden, Idaho, also Shirley G. Best succeeds Mr. Riedinger as chief of technical staff. Also C. Deane McGuire, chief development engineer, Louis A. Wilson, recent project engineer.

Carl Ross Babin (USAF ret.), has joined the planning and engineering staff of General Precision Laboratories, Inc., Roseville, N. Y., as an aviation consultant. (Continued on page 18)

INDUSTRY OBSERVER

► Douglas Aircraft Co. has again recommended General Electric as its choice to develop guidance and control for the air-launched ballistic missile, WS-138A. However, at Air Force request, Douglas last week made an additional presentation in Dayton on ground and flight phase considerations, reported to be Northrop's Northrop Division and Hughes Aircraft Co.

► Long-delayed Air Force decision in the Dyna-Soar competition is scheduled to be made this week, although funds for the program in the fiscal 1961 defense budget probably will be well below those originally projected by USAF. Decision is expected to spread the work between the two new peeling, boost-ramjet launchers. In January, the other is the X-15B, Gen. James Beland the long delay was a Defense Department request that Air Force take a second look at the program, particularly the booster, to find new ways of cutting overall costs (AW Aug. 31, p. 27). Air Force also was asked to review its plans for external management of the program within USAF.

► Air Force is scheduled to make its final fiscal 1961 budget presentation to Defense Department and Budget Bureau officials tomorrow. Assessment of program cancellations and transfers to fit the USAF program into its tight budget limitations are scheduled to follow closely.

► USAF Air Research and Development Command plans to stock bulk storage facilities missile detection technology originally developed for Navy. At present, however, ARDC officials believe the best storage area exists from a combination of the Ballistic Missile Early Warning System (BMEWS) and the Missile detection satellite. Such a combination would permit one system to check on the other, as well as provide substantial, rather wasteful time BMEWS alone.

► Studies of microwave altimetry to detect exhaust streams are being made for USAF by Stanford Research Institute, Menlo Park, Calif., under a \$225,000 contract related to the Minuteman ICBM program.

► Study requirements for a mobile version of the Minuteman, possibly about 1965, are now being pushed in an effort to accelerate the development phase of the mobile equipment already under contract with a number of firms (see p. 33).

► National Aeronautics and Space Administration experts to have a new conference in cooperation of Ames Research Center by the end of 1960. Conference will be used for space flight control simulation under integrated goals.

► Complete removal of most current design philosophy on solid core nuclear rocket engines built around very high chamber pressures is being studied at Princeton University. According to the Princeton study, it may be possible to increase specific impulse on these engines by 40% if chamber pressure is dropped to 2 psi. This would allow almost complete elimination of the high-gas propellant and lower structural weight of exhaust gas to one.

► Chance Vought Aircraft is proposing a space simulation facility to National Aeronautics and Space Administration that would create simulation of a number of the stresses and conditions man can expect to encounter in space flight.

► Ames Ballistic Missile Agency's scientific and technical team is currently conducting about one-third of its work for Defense Department's Advanced Research Projects Agency month as the Sabre vehicle was filed for USAF on the Jupiter (JBR) the final third is divided between National Aeronautics and Space Administration and the Army, with NASA presently acquiring more of the effort than Army. NASA work presently concerns the Sabre booster that will send manned capsules on short trajectories as part of the Project Mercury program.



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77 E. Franklin St., Danbury, Connecticut • Western office: 2855 Wilshire Blvd., Los Angeles 24, California

Washington Roundup

USAF-Industry Relations

Let Gen W. I. McKee, vice commander of the Air Materiel Command, lay out an industry to avoid any association with Air Force procurement efforts that could be interpreted as an attempt to influence the latter's decisions as the result of defense contracts.

Speaking to a group largely composed of industry representatives at the annual Air Force Asia convention and with the recent munitions lobby probe of the House Armed Services Subcommittee Subcommittee on defense in mind, Gen. McKee said:

"Civilian businessmen in their dealing with each other take for granted laws, contracts, mutual loans and so forth which are an essential aspect of public or business relations. In our community close working relationships between Air Force and industry businessmen, it is more and more important that these contracts be interpreted to the detriment of one against another."

"The Air Force people do not expect and cannot accept, plain business beyond the cooperation and assistance which are mutual respect and common purpose details. Moreover, even when there is no question of an attempt to influence government-public business of non-combat financing, which most inevitable find their way into the total defense bill is perfectly okay in their eyes."

By offering all occasion for the kind of criticism," Gen. McKee concluded, "industry can do much to retain public confidence and support in the vital work before it."

Hebert's Shadow Over Miami

Long shadow of the Hebert counterintelligence investigation of relations between the defense industry and military affairs also shaded the weekly electronic industry conference program for USAF officials, both active and retired, attending the annual Air Force Asia convention in Miami Beach. Only two parties were stopped by inspectors with their non-combat licenses such as Wright Jones, General Electric and General Motors. Among defense contractors picking up the tabs for official Air Force Asia convention were Ford, General Dynamics, Lockheed Martin Co. and Raytheon Corp., each with large, high level engineering Co., general Raytheon Aviation, International Business Machines Corp. and Avco, respectively and official hospitality parties.

Industry Criticism

Meanwhile, at least one member of the House Armed Services Subcommittee recently disappointed to find a thorough study of military procurement has already been leaked by rights at industry. In a speech on the floor, Rep. Ray White (R-Ill.) said: "Finally, I am disappointed in the silence and indifference demonstrated in certain corporations and individuals."

"The product is often a piece or work which not only has never been produced, but is only on a drawing board in a vapor state of air. It is difficult to find fault in the letting of such a contract and it is still more difficult to bargain as to price, for neither the government nor the maker can leave the contract out."

"As for related goods and materials, the specialized training and experience of these personnel is often greatly needed by the defense contractors. On the other

hand, a defense contractor may employ a retired officer capable for his business."

"These problems are very real and are among past criticism."

The subcommittee headed by Rep. Carl Albert (D-Cal.) was directed to make the study by a provision of legislation extending the investigation law (AWA, Pub. 27 p. 25).

Scientific Manpower

The House Science and Astronautics Committee last week called upon the Administration to submit specific proposals for legislation that would support the military scientific manpower program. At the same time, the committee recommended that the National Science Foundation, research and carefully continue, as total research, budget and organizational structure in accordance of more emphasis on scientific manpower to its scientific manpower program.

Airlines and Alcohol

The annual rash of bills, some of which are still pending in Congress, that would ban the serving of alcoholic beverages aboard scheduled airline flights are attracting much attention this year and are being to draw an impact from the United States Agency. In response to the latest congressional plea that a regulation be issued prohibiting a passenger from drinking on flight, FAA Administrator R. K. Quastler took a strong stand on the issue and said that was to evaluate that the "serving of serving alcoholic beverages on airline aircraft affects the safety of flight operations. He admitted there have been incidents that could have had an adverse effect on safety, but added:

"There have been cases by passengers who drink from their own bottle during the course of the flight or by those who had consumed a considerable quantity of alcohol prior to boarding the flight."

FAA has proposed a rule that would prohibit the consumption of any alcoholic beverages by passengers on flights that are not served alcohol by the airline and would prevent the serving of liquor by the air carrier to any passengers who are intoxicated in apparent violation.

Khrushchev on Armaments

Soviet Premier Nikita Khrushchev, due to arrive in Washington tomorrow, issued a final blast at Western defense leaders before leaving Moscow and a detailed list of charges of keeping Soviet nations with a high degree of readiness. In a speech to graduates of USSR armed services academy, Khrushchev said:

"Not only we did not allow them any more, but we also did not allow them any more. We have the evidence of a large number of military bases around the world, and the provision of West Germany as a consequence with atomic weapons. Under these conditions we are duty bound to strengthen the armed forces in every way and in every manner that we are able to, to a high degree of military preparedness. The Caucasian Peninsula and the Soviet government are showing constant concern for strengthening the defense potential of the country. They are doing everything possible to maintain the armed forces on the level of present day demands."

—Washington staff



BRITISH HELICOPTERS of Farnborough, on left to right, Westland Mercurys, Westland Wessex, Westland Whirlwind powered by de Havilland Gnome, and variants of Westland Whirlwind, Westland Widgeon, Saunders Roe P-311 and Saunders Roe Skua.

Aerobatic Rivalry Highlights Farnborough

By David A. Austen

Farnborough-Royal Navy and Royal Air Force aerial rivals, in spectacular flight demonstrations provided the major highlight of the 25th Series of British Aircraft Convention flying display and exhibition.

Vickers Supermarine, Secretary of Royal Navy's 507 squadron concluded their low level demonstration aerobically and concluded maneuvers with a landing surface that shook over the most sophisticated observers. Two Saunders tracked on the downward end of the maneuver and confirmed their collect

discovery while a third Sea Scout was in apogee on final approach. The two on the runway failed their wings put on time for the third to touch down a few inches from the Farnborough runway and not much more than three Sea Scout away.

Black Hawker Hawks of the RAF's 113 squadron used 16 planes in two teams, one of nine and one of seven planes, and concluded with a 16-man formation formation which looped and then broke up again for two separate formations, one observed out of a loop and one spread in climb.

Service participation of this type has been an increasingly large proportion of recent Farnborough displays for two reasons. First, the aircraft industry wants to show off its designs in service use, and second, the increasing complexity of modern fighter planes requires each test for living display.

Service Participation

Other service participation included the flight of three Avro Vikings and three Hawker Pigeons of Bomber Command, one Gladius (Jockey of Fighter Command), and a mixed group of Transport Command planes.

Newest of the British military aircraft on display was the Blackburn NA 39 strike aircraft designed for low-level assault under the numerous obstacles for radar detection.

Major interest in displays centered around a one-third scale model of the

British advanced stage model which the de Havilland Blue Streak.

Black Knight jet vehicle, mounting a short solid propellant second stage.

Black Hawk was shown in model form at the de Havilland stand. Height of the model is about 70 ft, diameter is 10 ft. Powerplant is a pair of Rolls-Royce turbojets based on development of the Rockwell and used in Thor, Jupiter and Atlas. Estimated thrust now being obtained from each engine is close to 20,000 lb.

Other Displays

Other displays shown included:

• **Beard's Bloodhound** anti-aircraft weapon system powered by a pair of Beard's Saddle-Thrust engines. The Bloodhound now is in service with the RAF's 261 squadron, a former night fighter outfit. Current form the weapon has been fired the week at the Silver Jubilee Ring in Wales. It has been against against Miran and Cosmos aircraft at Woomera at altitudes up to 50,000 ft.

• **English Electric Thunderbolt**, a subsonic anti-aircraft missile as one of the British army. Thunderbolt is under further development and its advanced version will probably be produced by the army.

• **Short Scout** short-range rocket-propelled missile.

Sedov IAF President

London—One of Soviet Union's best space scientists Prof. Leonid E. Sedov, was elected president of the International Astronautical Federation at its 20th Congress (Aug. 5-9) in St. Sofia in October of the USSR. Next day of September 22 was designated an international communications day.

Sedov's election may strengthen the possibility that a future congress will be held in Moscow although past efforts to organize for a meeting have failed. Next year's meeting will be in Stockholm.

Russia first participated in an IAF congress in 1953 when Sedov and Prof. Igor Oparnikov attended as observers. In 1956 Sedov attended as a delegate and was elected a vice president, collecting an abstract for IAF to submit an international thesis and avoid any appearance of domination by Western countries. Sedov has headed the delegation and been re-elected vice president each year since then.

This year's congress named Dr. Theodore von Karman leader of a committee to explore the problem of coming to a rationalized system of astronautics. The open bar convention, held in conjunction with the congress, approved a plan of an international institute of space law.

a remote under development for the Royal Navy, chosen for a multiple launcher study by Royal Navy, L31. The Scout is powered by a solid propellant motor.

• **Newington Whitworth's Sealing**, for Royal Navy, chosen for a multiple launcher study by Royal Navy, L31. The Scout is powered by a solid propellant motor.

• **De Havilland Thunderbolt**, chosen for the first time with its related firing system actually received. Two rings of triangular springs, just behind the aircraft, that pushed back, have released detectors which lock up target acquisition and by solving the triangulation problem, get a proximity signal to the target and set off the warhead.

New engines on display as a backup or backup form for the first time at Farnborough included:

• **Beard's Saddle-Thrust** engine, making showing the fuel and boost. Engine is about 14,500 lb of static thrust for a weight of 2,500 lb and a thrust-weight ratio of 5.6. Sea level static fuel consumption is 9.572 lb/hp/hr, and at cruise conditions of 5,000 ft, the consumption is the same as about 8.1 lb/hp/hr. Cold-flow ratio for the engine—the amount of cold air passed through the fan compared with the amount that goes through the combustion cycle—is the engine-to-be ratio 1.5 and 2.

• **Rolls-Royce RB 141** rocket engine, the general outline of the engine core scheduled to start running next month. Production engines of 14,000-lb thrust rating are expected to be available from the beginning of 1962. The engine is smaller, but larger than the RB 141 which will be used at 10,000 lb and will power the DB-121 (Aug. 31, p. 61).

• **Rolls-Royce RB 148** Avon, shown in finished form. This engine is the latest in the long line of Avons that started out around 7,000 lb of thrust. Current rating of the RB 148 is 11,200 lb without afterburning.

Hawcroft Flight

Recent events in the flying display was the Saunders Sea Hawk, built by that firm for the National Research and Development Council.

The Hawcroft took off as a cloud of dust, glided down the runway past about one foot of the ground, and then started to pick up a load of 20 Royal Marine commandos.

Avro Vulcan B Mk. 2 pointed one of the main barrels of the jet with a very short climb after a short take off, rapid descent by the threat of its four Bristol Siddeley Olympus Mk. 100 engines. These engines are rated at 17,



BLUE STREAK model is one-third scale, new one shown does not represent full configuration. Blue Streak is 74 ft long, 18 ft in diameter.



SAUNDERS-ROE Hovercraft, built for National Aircraft and Development Council, is test vehicle used to prove out its cushion lift principle. During Farnborough demonstration 33 Royal Navy commandos were carried in addition to the model business crew.



HOVERCRAFT rises off survey during ground effect demonstration at Farnborough. Craft runs a propeller jet as main thrust, assisted by the supporting air cushion (A/W just 20" p. 64). Powerplant is a 155 hp, five piston engine.



WESTLAND WESTMINSTER lifts a padded section of a new paratrooper badge over water development for British Army engineers.

600 lb thrust each without afterburning, but a single engine on the Bristol Siddeley stand has been run at 53,000 lb thrust with afterburning. Engines in the Valour probably are delivering something on the order of 25,000 lb thrust each with afterburning.

Blackburn NA.56 in flight showed somewhat tight roll characteristics, with no indication of wallowing or stiffness, but. Plus was shortening inbound flaps for landing, supplemented by dropping slats on the gear, a full span flap with two different deflections.

Flying Highlights

Chief highlights of the flying display:

- **Blackburn** space acrobatics in. Rex and Porters, in an Avon Airline trainer Porters has been evading the crowd at Farnborough for at least a decade, with impossible acrobatics done in what seems like a 180-yd cube of air, coming out at an impossible height and attitude and then making steep dips right and left on to the runway and continuing down the runway alternately yawing left and right wheels.

- **DG Bedford**, Hawker chief test pilot, spinning a two-seat Hawker through more than 10 turns, trailing white smoke in a confusion against the sky.

- **Hoover** of the dog club of the English Electric P.31 trainer-lifter, a two-seat Lightning, during the flying on opening day. R. P. Bennett, who had just completed his second spectacular series of low-level flying turns.



BRISTOL 192 trainer-lifter displays ability. a Bristol Bloodhound helicopter made an air transport stand. Bloodhound now is in service with a Royal Air Force squadron and has registered bids at 90,000 lb during flights at Warton, Lancashire, 1959.



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design initial production. Then a sliding scale of incentive was negotiated, based on savings in expected production cost.

Substantial emphasis is also placed on performance incentives. Naval performance, pattern was determined on the basis of more than 300 tests on the first 27% of production. Now, it is based on number of repairs, spare parts requirements, required service and other factors, and incentives were set for improvement on overall performance.

USAF Considers Development Of Multi-Purpose Aircraft System

When Rock, How-Ar Force is very early considering the feasibility of developing a multi-purpose, long-range aircraft that could be used interchangeably for offense, defense, reconnaissance and high speed combat roles.

More, according to USAF Chief of Staff Gen. Thomas D. White, the aircraft would incorporate supersonic speed with a high altitude capability and a long land cruise capability.

Gen. White told delegates to the annual Air Force Arm. convention here that such an approach might be the answer to the problem of solving the cost of advanced weapons systems in the long run. The high cost of such systems, White said, makes it "impossible that we find the means to reduce quantities and types of weapon systems as rapidly as possible without jeopardizing our combat effectiveness. This is a primary concern of the Air Force."

Need for a follow-on long-range aircraft to one of 30 Air Force "mainstay" missions, he outlined the Soviet threat over the next decade according to Gen. White, who emphasized that national aircraft will continue to play an important military role in the foreseeable future. "Ballistic missile and other air massed vehicles," he said, "are not in our and may never be the solution to all defense problems."

First two "interests" laid down in Gen. White were the environmental ballistic missile and long-range air-to-air combat roles which are now being used to enter the active Air Force mission.

- Others included:
 - Advanced tactical roles, including air-to-air combat capability that can react quickly and effectively with other conventional or nuclear weapons. USAF wants Gen. White and, toward missiles with longer range, better maneuverability, better mobility, more flexible tactical guidance and greater accuracy. These weapons, he said, must be backed by an improved tactical control system, including better tactical

radio, communications and data transmission and display.

• **Ballistic Missile Warning System** that gives "positive" warning. Gen. White noted, "There is growing concern about the possibility of a missile attack being detected under Air Force and Advanced Research Projects Agency sponsorship."

• **Language** defense incorporating US military principle of area defense as opposed to the Soviet "point defense" concept. "To counter the current threat of an incoming missile, that's what Gen. White said. "We consider that long-range surface-to-air missiles and air-to-air missiles are needed. As far as the ballistic missile threat is concerned, the key is to speed up such missiles and the work area of potential destruction contained in their warheads. The objective is the destruction of its attacking such weapons as soon as possible, after launch."

• **Interceptors, reliable and secure communications.** Air Force's "superior" surface-to-air missiles, Gen. White said, must be reliable and more than ready quickly. White said USAF also needs improved reliability and security in its cryptographic systems for some data and personnel and has a "critical" requirement for a reliable world-wide relay capability. The communications activities now under development in the NDRUS program (Navy, Air, US, in "coordinating" personnel) he said.

• **Advanced reconnaissance systems,** including Project SMOG, a new design from the USAF/ARPA Project Scout under development in Lockheed Air Corp.'s Manned and Space Division.

• **Modernized cargo fleet** with greater payload, speed and cargo characteristics.

• **Advanced ground-to-air systems.** To eliminate the lack of man. The first aircraft would be a lightweight system that could be dispersed around various bases or other surface vehicles in order to give mobility and increase its overall potential.

He also emphasized the need for such

in both space and conventional weapon systems. Gen. White was joined by Gen. Thomas S. Brown, commander of the Strategic Air Command. Gen. Brown and Gen. "will come a time when we will gradually give some defense lead to attack," adding, however, that "we oppose it will always have a mixed lot."

Gen. Power also contended that SAC is providing 90% of the U. S. defense force, while receiving 10% of the defense budget, and his command is now working to improve its position in these specific areas.

• **Tightening its defense against possible sabotage of the SAC bomber fleet on the ground.**

• **Eliminating its bases against attack.** "You must consider our needs," Gen. Power said, "so that they can withstand a new war. Nothing is more or less can withstand a direct hit by a nuclear bomb." U. S. missile sites, he pointed out, must be capable of surviving a direct attack on the country. "We'll need launch orders on a tactical war, because, once they go, you can't call them back."

• **Dispersing its bases to "leave the enemy" "ambush, launch" and "survive."** SAC's capability of getting its aircraft into the air on short warning times. The present dispersal program also is being to allocate the seven "trials" of SAC aircraft on a limited number of bases. A member of Gen. Power's staff pointed out that the number of aircraft in the command has almost quadrupled since 1950 while the number of aircraft has barely doubled. Gen. SAC has, he said, currently accommodates a fleet of 100 bombers and 40 bombers. Under the dispersal plan, each SAC bomber wing will be divided into three squadrons, each with 10 aircraft.

• **Expanding its alert force, which Gen. Power termed the "backbone of our posture."** SAC goal is to have at least one third of its bomber fleet on a 15-min alert to 48 hours. The 15-min warning time it hopes to reduce. A 24-hr. airborne alert has been tested and found to be feasible. "There can't be a 24-hr. alert," according to SAC officials.

He also emphasized the need for such

Mercury Test Launch Falls Short of Goal

By Craig Lewis

Washington—Test flight for test of a biologic Mercury capsule failed short of planned goals last week when the Atlas booster malfunctioned but the test still provided a valuable insight into the recovery system when the capsule was quickly separated from its misbehaving landing spot.

Although National Aeronautics and Space Administration's Mercury capsule was sent through an scheduled flight plan, it did not reach full altitude and velocity because the Atlas booster failed to drop its first stage capsules and start the second stage in the first time Atlas failed to drop its booster stage, kept the vehicle below peak velocity.

Because of the added weight the capsule loaded in the Atlantic ocean banded rocket shot at the planned loading up 2,000 in down the Mercury Main Test Range from the Cape Canaveral 14 launch site. The recovery system worked well however and the capsule was quickly from the air about three hours after launch and picked up five hours after it was ejected.

Big test concept provided a valuable indication of actual in tests, recovery tests for the Mercury capsule. Atlas can carry the capsule to an altitude of about 100 mi., then turn it along a flight path attached to the one it will follow when actually coming out of orbit. The nature of the recovery flight path occurs along the initial ascent into and possibly a recovery test of the dynamics of recovery flight of the Mercury land shield and of the recovery system.

Purpose of Test

Big test was designed to provide information on the vehicle heat shield on the test capsule as well as temperature data on the capsule. Internal and external nose sensors were to be tested and acceleration and deceleration points measured. Big test also was a test of the control system recovery unit, booster and payload separation and data transmission, recording and tracking concepts.

While the test was not a complete success, it did provide a valuable insight into the recovery system when the capsule was quickly separated from its misbehaving landing spot.

Biologic capsule used in the first Big test was the same one and was quickly ejected at 7,000 ft. as the actual Mercury capsule but it had no

except to test on scheduled path, once the vehicle had been positioned before recovery. Inner structure house built within the capsule being built by McDonnell Aircraft Corp. since it had such a small payload could designed by NASA's Lewis Research Center to hold 700 lb. of test material in addition. Mercury capsule landing was built at Langley Research Center and joined to its test shield at Cape Canaveral.

Heat shield was an addition type made of glass fiber and resin by General Electric Co. and B. T. Goodrich Co. NASA is considering both addition and heat shield for the first capsule design, and this was the first full scale test of one of the competing shield types. Mercury temperature on the shield was expected to reach about 3,000°F during flight through the critical re-entry area between 10 and 16 in altitude.

Temperature Measurements

Temperature was measured every 1.5 sec at 32 points on the heat shield and it also was measured at 50 points on the side and under the fuselage. Temperature in the pressure vessel was expected to hit 250°F during re-entry and to be kept between 500°F and 1,000°F the remainder of the time. In the air, the re-entry temperature was expected to be 5 in. beyond fuselage skin ranged up to 1,500°F.

Two microphones spaced around the capsule recorded noise levels expected to reach a 135 db peak during re-entry. Biologic capsule was lined with up to two inches of insulation to cut noise level and noise. This actual Mercury capsule will be more heavily insulated.

Instrumentation was carried to measure pressure, speed, gas capsule control gas and several other items and to house 10 channels of information to ground stations through a 10-msec broadcast on standard FM band. Recovery also hoped instrument read out for analysis after recovery. To ensure information was not lost at the time, it was carried on the capsule during a three-minute in-orbit period and broadcast after the recovery. Broadcast was over.

At 10,000 ft. acceleration forces were expected to run about 5g, and peak deceleration during re-entry was expected to hit 10 g at about 200,000 ft.

Atlas D booster was programmed to boost the biologic capsule up to an apogee of 100,000 ft. and then to drop the capsule along a ballistic flight path and accelerate it to 17,270 mph. Failure of

the first stage shot with its two booster capsules to separate from the Atlas on re-entry kept the vehicle from reaching these goals.

After the vehicle reached its peak velocity, explosive bolts separated the capsule and booster, and retro-rockets fired down the booster. Retro-rockets fired down the capsule around the heat shield and forward and shrouded the heat of re-entry heating. Telemetry data was received at Cape Canaveral, Antigua, Grand Turk, and on recovery ship. Control and recovery was made by McDonnell-Hawley and Republic Co., Antigua; by General Electric and Westinghouse by Electro-Mechanical Research, Inc.

Recovery System

Mercury recovery system poses the capsule's drop parachute at 60,000 ft. and make chutes is expected. The nose chute is deployed at 40,000 ft. and recovery aids are activated, including two standard recovery radio beacons, a SORAR beacon, under the surface of the water, which explodes at 5,000 ft. and a floating light.

Valve Failure Aborts X-15 Flight

Edwards AFB, Calif.—Fluctuating between pressure caused North American Aviation test pilot Scott Crossfield to abort the first powered flight of the X-15 biologic vehicle four minutes before drop from the Boeing B-52 mother ship.

The X-15 was at 100,000 ft. and the fast, powerful biologic. Weather conditions were good, except that Crossfield would have had a 14 ft tailwind on landing, not enough to cause concern. He decided to abort the flight when a pressure indicator valve failed during the final run to the coast drop point.

The faulty valve reduces liquid hydrogen fuel to about 7,000 psi, to about 50 psi for pressurizing the fuel tanks. Hydrogen pressure for the auxiliary power unit was exhausted, but

Crossfield was allowed when the capsule hit the water. Recovery system is built by Republic Division of Northrop Corp.

Recovery force directed from Cape Canaveral included destroyers, AMR helicopter ships, an Air Force tracking ship, several small auxiliary craft and an LST converted into a helicopter carrier as well as Air Force Douglas C-124 transport aircraft, Navy Lockheed P-3V patrol aircraft and the USAF Air Rescue Service base from Orlando AFB.

Big test was fired from Cape Canaveral at 11:40 a.m. and was expected to suggest about 2,000 in down the capsule at a point several hundred miles north of Antigua. It actually landed about 100 miles north of Barbados. The SORAR beacon was activated and a P-3V from Antigua made the first visual contact with the capsule at about 6:30 a.m. after hovering on the radio beacon. The destroyer USS Strang picked the capsule up five hours later. The aircraft and recovery of a capsule that missed its intended path, by a single margin provided a graphic test of the efficiency of the recovery system.

lined in the liquid oxygen and shrouded heat capsule and the X-15 was brought back here still being to its palm under the B-52 right wing.

Flight plan for the first powered flight calls for the rocket powered craft to reach approximately 50,000 ft. and Mach 2. After drop at 35,000 ft., the X-15 will descend to 14,000 ft. to be shot lighted of two Reaction Motors XLR-11 RM engines a complete.

All right of the two four-chamber engines will be fired and shrouded compressed.

Three pressurizing, the plan also calls for shrouds and control electronics tests such as attitude, altitude and distance probes and shrouds static shrouds.

Although the two test capsules produce about 15,000 lb. of thrust each, about 50,000 ft. for the XLR-99 RM

altitude capsules, the thrust on the capsule is expected to keep speed at 10 in before Mach 1 is crossing indicated drop. This is based on a roughly used as a speed reducing (reducing in fact, then almost).

Crossfield, disappointed at the last minute, considered the test a success at a stage in the program that he didn't feel justified in completing the flight with a known discrepancy.

North American's project engineer, Herbert Starnes and the first powered flight will be considered a success, even though. No 2nd test will make the first powered flight. No 1 capsule shot the first free flight light (AW Jan 15, p. 29).

News Digest

General Electric's Small Aircraft Engine Department is developing a 4,000-hp biologic engine designed to the CF700-1 for light and medium weight commercial aircraft. The engine is basically a 155 subsonic ramjet with an all air flow in the CF700-1 has a design weight of 1,000 lb. and a thrust of 4,000 lb. The engine will be made for delivery by mid-1960 and Federal Aviation Agency certification early in 1962.

General Electric Co. has made a buying agreement with the West German government for BMW Turbodiesels for Gambia to produce 170 turbodiesels for Lockheed F-105s purchased by West Germany as spare. Orders already placed with BMW total \$75,000 million.

Pitt & Whitney Aircraft modified 157 biologic engine test in test in progress in Columbus-Gulfstream, Georgia Co. to do a specially designed Cooper-Bessemer power turbine and centrifugal compressor for gas transmission. The gas engine plans to build a prototype test at its Clearwater, Fla., plant, to produce a gas engine for power (honeycomb) for study and testing.

Polytechnic Institute of Brooklyn, N. Y., will study to carry characteristics of ramjet and conventional open vehicle and engine configurations under a \$70,000 Army Air Force Missile Agency contract.

Matsuda Military Electronics Division will develop the engine and traffic control system for the North American B-70 Mach 3 bomber. System includes conventional, navigation and IFT equipment. This contract is the latest electronic work to be sub contracted to the B-70 program.

Hilton Breaks Into Airline Credit Field

Pacific, Western adopt Carte Blanche credit system; ATC plans big expansion of air travel card privileges.

By L. L. Doty

Washington—Hilton Credit Corp., sponsor of the Carte Blanche credit card system, has made the first successful breakthrough into the air travel charge account field, said one of the airline industry's Universal Air Travel Plans.

Meanwhile, the Air Traffic Conference, in response with International Air Transport Assn. of the air travel plan, expects to announce on Oct. 15 a broad expansion of credit privileges for air travel card holders that will extend those now available under most credit plans. Most traffic officials stress that the move is designed to counteract the effects of the Hilton move.

Pacific Air Lines has been accepting the Hilton cards for credit against the purchase of tickets since June 15. Originally, the cards had to be used on flights to the plan with the Civil Aeronautics Board, but the Board decided otherwise, and the airline filed its tariff covering the arrangement with Hilton last week.

Western Air Lines, has filed a similar

tariff, although it is still in negotiations with Hilton. Target date for signing of the agreement between the two companies is Sept. 15, at which time Western will begin honoring the Carte Blanche cards. A wide-scale promotion campaign will launch the plan last spring. Western gave its first card that it was ready to expand credit facilities to passengers when it voted on Air Traffic Conference resolution designed to confirm all airlines an equal credit to the Universal Air Travel Plan (UATP).

Hilton is now heavily engaged in talks with other carriers in hopes of expanding the program throughout the industry with equal access to air travel charge accounts now plan to take. So far, the credit companies have talked with Capital Airlines, Pan American World Airways, Trans World Airlines and United Air Lines. It has also talked with some foreign carriers, who will need IATA approval before adopting the plan.

Hilton success in making deeper inroads on the airline industry depends much on the shipping, Pacific and Western, cards and the Carte Blanche program. A number of airline officials skeptical to American Express, that it would credit could have other carriers to join the Hilton credit system or some other plan.

Pacific has expressed a 20% increase in dollar volume per week since adopting the plan. Hilton has not projected any figures for Western since the program. Pacific has had favorable, there are not many strong competitors to Hilton's challenge to the UATP. A spokesman for the American Express Co. told AVIATION WEEK that the firm is still talking to a number of airlines and expects to report favorable

results in two or three months. American Express was threatened on an earlier attempt to move into the airline field. Because it is defined as a travel agency, the Air Traffic Conference ruled American Express could not qualify as a credit agency for the scheduled airlines under the existing terms of ATC agency resolutions.

American Express does have credit arrangements with food house operators for its second division, but its transportation and with several airlines.

Boeing's Clark Inc. has offered a credit plan to Western and can be expected to move into the airline market soon. It has made credit arrangements for its members with a number of travel agents to merge efforts.

The Universal Air Travel Plan is not necessarily threatened by the reason of outside credit system. To begin with, the program requires a credit card, not a check, which would cover restaurants, hotels, car rentals and other facilities used by travelers could eliminate any need UATP card holders might have for other credit cards.

In addition, in most cases the UATP could prove less expensive than other plans despite the MATS deposit required at each subscriber. The UATP deposit system only one account for the insurance of an unlimited number of cash under each account. Most other credit systems, but no deposits, but they carry a charge of an average of

VC-10 Design Details

Four-engine, English-Finnish built on Vickers VC-10 transport model. Its British parent, Vickers, has completed design for the aircraft.

Design figures show that the VC-10 will take off from a 7,000-ft. runway at a maximum weight of 299,000 lb. and has a 1,000-mi. range at 14,000 ft. The aircraft's maximum speed is 1,400 mph. It is designed to take a full 30,000-lb. payload to a 4,000-mi. air distance with fuel on its own before plus a 25% wet net derivative after a voyage.

At maximum landing weight of 177,000 lb., the approach speed is about 122 kt., the approach rate.

Maximum is 140 ft., overall height is 151 ft., height in three-quarter attitude is 41 ft. High-lift devices by means of which 149 passengers at maximum seating configuration with a 54-in. seat pitch. Freight loads below the cabin floor have 1,750 sq. ft. capacity.

56 per year for each of the seats. As a result, an expanded use of the 164-cord fleet in the industry could possibly draw a sizeable UATP subscriber who only carry a small number of cards under their accounts. However, large accounts—and those represent the responsible field—will be financially unattractive to stick to the UATP system.

Deposits under the air travel plan are raised on the basis of the scheduled airlines in current history and with substantial lag. For example, American Airlines UATP deposits was \$9.9 million as of Dec. 31, 1958. United deposits totaled \$6.4 million as of the same date, and Western showed \$4.9 million as of that date.

Chief advantage of the Hilton plan is the quick transfer of cash to the airline. Pacific now shows drafts on the Hilton Credit Corp. once a week, although Hilton has outlined the carrier that it must draw drafts if it desires Western plans to use the world's method of billing.

Under the UATP, airlines often must wait in line 90 days for payment of billings, and since airlines billings "not into the airlines," the airlines constantly have, in effect, a big, relatively slow revolving account.

In addition to expanding credit facilities to vendors, the airlines, the Air Traffic Conference is strengthening the program within the industry. On Sept. 15, new plan-type cards will be issued, and credit privileges for air line services will be extended to:

- Provide for the purchase of future transportation which used an account from one transportation.
- Facilitate purchase of hotel rooms and other ground services which part of an scheduled tour package.
- Facilitate purchase of the transportation of a private car to air.
- Enable passengers to change flight credit of personal luggage in air cargo and on freight.

These amendments to the plan are now being circulated among the 111 airline members of the UATP for their advice. On the 111 airlines also had expanded late last week, some failed to approve the measures.

Under the arrangement with Hilton Western and Pacific may still only cash tickets. If the plan is expanded to include other carriers the sale of interstate tickets will be permissible.

Hilton will charge a 4% fee for the service under the present arrangement with Pacific and will collect a service charge to Western when that agreement is signed.

Western plans to use the same fees for billing that it now uses under the UATP. Hilton will convert the membership on the Western member basis to IBM billing cards.

MATS Chief Seeks Turbine Planes, Urges Expanded Air Transport Use

Missoula, Mont.,—Modernization of the 10-year-old fleet of Military Air Transport aircraft with gas turbine-powered engines, plans, and expanded use of air transport by the Department of Defense for personnel and loads, not cargo were urged by Lt. Gen. William H. Boyer, MATS commander, at the Air Force Assn. convention here.

Emphasizing that the 24 Douglas C-124 transports now operated by MATS are among the only modern equipment less than 10 years old in the 485 plane stock of four-engine transport, Gen. Boyer said MATS would like these types of modern transport.

Expanded technological progress capable of producing aerobically improved equipment for Strategic Air Command. This requirement could be filled by the winged-wing design version of the Boeing 707, Douglas DC-8 or Convair 440, he said.

Transportation equipment would have to replace the current 250 plane C-124 equipment of MATS. Gen. Boyer said USAF is now preparing a General Operational Requirement for this category and that it should be capable of carrying an annual payload of 100,000 tons.

Special cargo planes for unitarily loaded cargo are needed, Gen. Boyer said. The C-124 would be the requirement adequate and MATS planned a total of 50 C-124s to meet this job.

Toward that, the Defense Department and USAF expanded an effort to air transport to commercial airlines and manpower to the Army and Navy. He said USAF now issues 95% of its personnel orders by air and expects to increase rapidly in the part of its high cost items to reduce procurement and inventory required with cargo aircraft.

Adoption of a similar policy by the Department of Defense could mean a significant increase in military activity. Gen. Boyer said "This additional military activity could be made available to commercial carriers."

"The military growth of the civil air cargo industry is just around the corner," MATS believes it but it cannot overemphasize that this civil growth must be generated by new air carriers and not by existing ones.

"The military growth of the civil air cargo industry is just around the corner," MATS believes it but it cannot overemphasize that this civil growth must be generated by new air carriers and not by existing ones.

But he had some little support from the airlines to Air Department of Defense on an expanded cargo program. Noting that the solution of MATS with the civil airlines was a hope of an additional current discussion, Gen. Boyer said he would be happy to discuss on this subject due with the following:

- MATS is not in competition with the commercial airlines and has great a significant success of its military business in the civil air cargo field.
- MATS must operate at an average aircraft utilization of less than one day to prepare adequately for its wartime mission whether it flies empty or with passengers.
- By carrying passengers and cargo in passenger rather than flying empty it saves money for the Defense Department and improves.

•MATS believes in development of a small commercial cargo system but does not have any responsibility for establishment of such a system.

•MATS would like to join with the airlines to determine ways and means to increase present use of air transportation and would like to develop close and amicable relations with the air transport industry so that each will support the other's policies.

Gen. Boyer said preliminary plans for carrying the Air Force Air Force program beyond the "open air" program and noted that MATS employed only 574 crewmembers and the 485 aircraft reported in Congress. He directed MATS to the advantages of the program, that they were also trained in traffic duties and would support MATS emergency response to the range for its wartime mission.

TWA 707-320 Plans

New York—Trans World Airlines will enter the jet age on the North Atlantic Nov. 23 when it begins three weekly flights to New York and London with Boeing 707-320 aircraft.

The New York-London flight, which will continue on to Frankfurt, will complete the company's portion of the east-bound Super 6, 6 hr., 25 min. flight. The airplane configuration will accommodate 174 passengers—12 first class and 162 economy class.

On Dec. 1, the airline will introduce its inbound jet on the New York-Frankfurt route with the Boeing 747-100. Pan American and British Overseas Airways Corp. began jet service with the Boeing 707-120 on the Philadelphia-Cornwall route last October.

'Cooler' Fuel May Add Range, Cut Smoke

By Michael Yaffe



The nation's new air-borne missile launcher

The new B-52G, now in operation with the Strategic Air Command, brings a new dimension and unprecedented mobility to the missile field.

Beyond its regular load of nuclear weapons, the



Bombing mode in position with thrust wing.

right-jet B-52G carries supersonic Soviet Dog missiles for a 4,000-mile bombing toward targets beyond standard nuclear war.

The B-52G is the most versatile long-range weapon system in the U.S. arsenal. It is new, and for years will continue to be, a proven reliability defense weapon not dependent upon foreign loans. It is also a proven weapon system that combines accurate long-range guidance with mission reliability and supersonic weapon delivery.

The world's longest range jet, the B-52G can open oceans and return to base in the U.S. without refueling. On a single refueling defense mission, each B-52G could strike several targets thousands of miles apart.

BOEING B-52G

New York—Cruiser pylons at night and low exhaust smoke are the primary goals of a new, low luminosity, turbine fuel now under development for combat aircraft.

According to Texas, one of the advantages of the new fuel, one of the low luminosity fuel will result in greater thrust on take-off, cooler engine operation and longer engine life, and the virtual elimination of exhaust smoke on takeoff.

Port & Whitney, co-developer of the fuel, is considerably more conservative. On the basis of extensive engine tests at the new fuel in the J57 engine, the company believes that most jet operators would benefit from the low luminosity fuel, primarily as a result of its greater energy content per pound.

On the basis of engine tests at the new fuel in the J57 engine, the company believes that most jet operators would benefit from the low luminosity fuel, primarily as a result of its greater energy content per pound. Approximately 19,000 lbs. in weight (15,000 lbs. in J57 type fuel). On a two-engine Boeing 707-120 flight, for example, this could mean, subject to actual flight test substantiation, that approximately 1,000 lbs. of payload could be substituted for fuel.

Due to its lower luminosity, the new fuel reduces less heat than present turbine fuels to those parts of the engine that actually "see" the flame, permitting the engine to run at a higher temperature. But the low luminosity fuel is not a problem area and would not benefit substantially in use of the low luminosity fuel, according to Port & Whitney. In the first stage turbine alone of the J57, where high temperatures are critical, the heat is not caused by radiation and so would not be diminished by a low luminosity fuel.

Component Worry

If an airline wants to use the fuel, Port & Whitney says it will maintain the engine components for the new, smaller of luminosity in its own operations with present fuels. It will not provide any longer life for the fuel parts of the J57, so longer periods between overhauls. The company has not written a specification for the new fuel, but does intend to make an airline operator's case.

Port & Whitney estimates that the new fuel will eliminate 50-60% of the exhaust smoke generated by the J57 on takeoff, but is not sure just how significant this result is. Stemming from the same source as luminosity, severely reduced particles of carbon smoke is caused primarily by the use of a direct injection by a separate throat on takeoff. It does not appear to be

detrimental to engine or aircraft operation, but it can lead to a dangerous, carbonaceous problem.

Dr. Leonard Greenberg, commissioner of New York City's Air Pollution Control Department, has made no attempt to measure the pollution factor of conventional jet aircraft operation from New York airports. At that time, he was not able to carry out an investigation of aircraft operation with the engine, but he did note that there was good evidence in the exhaust area and the smoke was not dissipated.

In Los Angeles, Supervisor Kenneth Blakes of the Air Pollution Control District has discussed the problem with the Airport Commission and has had one of his engineers, Ralph Greenberg, write to Port & Whitney for jet en-

gine combustion information. Like Dr. Greenberg, Greenberg feels that the contribution to the local air pollution problem is not significant at present, but could prove to be in the future.

Jet Complaints

Thomas Tavers, chairman of the Los Angeles Social Abatement Coordinating Committee, has asked Port & Whitney for combustion information. Five of the 115 jet complaints lodged with his group in the past three weeks were in regard to the smoke.

Engineering departments at most of the major airlines, currently looking for improvements in operating efficiency and economy, have expressed interest in the new fuel. Most of them consider

Low Luminosity Fuels

Low luminosity fuels are fuels which burn with a low visibility—less yellow and more blue-white.

Studies have shown that luminous flames transfer more radiant energy than non-luminous flames. In some instances, particularly with solid fuels, high radiant heat transfer is desirable so that it provides combustion by carrying heat from the combustion zone back to the unburned fuel.

In a turbulent combustion, however, when it contributes a large share of the total heat transfer, thermal radiation is undesirable because it produces high temperatures in engine components that "see" the flame and, by conduction through these, in other parts of the engine. Also, with the development of advanced jet engines which operate at higher temperatures and pressures, radiation becomes even more of a problem due to the fact that radiant heat transfer now operates with an intense infrared radiation while more conventional combustion heat transfer operates by conduction.

These luminosity is generally not to the detriment of most or unimportant when direct engine operation. It is especially undesirable when water injection is used as a means to reduce the water quenching the carbon before it has a chance to burn to the turbine, produce carbon deposits.

Turbine engines, of course, are in their infancy in service, with or without water injection, and it is known that the design of the engine and its components may affect this. Research, however, Port & Whitney pointed a perspective effort with Texas to find what effects different fuels themselves had on smoking, burning, and radiation rate, otherwise possible, to relate these effects to the physical and chemical composition of the fuel.

Finally, they found as follows:

- Chemical and physical properties of fuel significantly influence flame radiation.
- Aromatic and aliphatic compounds produce flame radiation, aromatic more so than aliphatic, and sulfur compounds the effects of the other.
- Aliphatic fuels produce the least flame radiation.
- Known fuels produce more flame radiation than J57-type fuels.
- Flame radiation tendencies of fuels are usually proportional to their heating values (Btu/lb.).

These radiation and combustion smoke systems to be clearly related.

From this work, the answer to the problem—many engines won't get it to a particular flame radiating system to be a problem—low luminosity fuels, such as a fuel would have a higher ratio of hydrogen to carbon and would have less of a low luminosity flame.

Also, a method of determining flame radiation was developed. The temperature of a specified radiant energy level, thus, having a given fuel is measured and compared with that of an infrared fuel, and, as the lower the fuel is given a luminosity number. A high luminosity number, as it worked out, across a low luminosity. Present turbine fuels have a L.N. rating index between 41 and 60 while the new fuels may run to a L.N. of 135 and higher.



Fast, One-airline Service Across the World

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FLY THE FINEST... FLY **TWA** TRANS WORLD AIRLINES

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the matter still in the "talking stage." In general, their reaction is that as far as they see sound engineering data proving that the advantages of using the new fuel outweigh the disadvantages, they are content to use current fuels.

At this time, the principal disadvantage of the new fuel is its cost. While no final price tag has been put on the low kerosene, fuel, petroleum engineers generally agree that it will cost more than present turbine fuels which sell at 14 cents per gal. delivered to the airport. While no one was willing to offer an definite cost figure, one informed estimate placed the price increase of the fuel up to 2 cents per gal., plus tax.

The low kerosene fuel falls in the gasoline-burning range and will be subject to the 2 cents per gal. federal tax which governs commercial turbine fuels, as the kerosene-burning range does not have to bear. Although the tax is not overly significant to an eastern operator such as Pan American which buys most of its fuel outside of the United States, it is an important consideration to domestic airlines. Many northeastern people, however, believe that Congress may abate this 2 cents per gal. price differential by extending the tax to the kerosene fuels.

Fuel Incentives

Discussing incentives for use of the fuel, a TWA spokesman notes that most of its Boeing 707-120 flights now operate on a weight-based basis. Fuel is now the maximum allowable take-off weight. There are no limits of engine space available for additional payload if the weight of the fuel required for the flight could be reduced.

"Another potential pay-off of the new fuel is its increased range. This is an aspect that the Air Force is particularly interested in. Low increased payload, however, the range factor also still has to be proven in actual flight tests and at the moment, no group has any plans for doing this. American Airlines indicates it might be willing to flight-test the fuel if it gets full-scale engine test data from Pratt & Whitney.

Strike reduction, for the time being anyway, does not seem too important to members of the airlines.

Some engineers, however, believe that one of the more powerful benefits and advantages engineers will get from jet engines is that as an engine is almost inevitable that as an engine, as an effort to boost payload, will eventually result in augmenting the thrust of the fuel jet, jet engines will suffer negative. Both airlines and the Air Force, on the other hand, are interested in the longer



United Air Lines Develops DC-8 Loading Stand

United Air Lines engineers developed the mobile passenger loading ramp which will be used Friday when United starts its Douglas DC-8 jet transport service between New York and San Francisco (AW Sept. 7, p. 16). Unit is powered by an electric motor and is maneuvered by a operator seated at top control panel. Prototype was built by General Electric Electric Corp., Stamford, Conn. United has produced 82 stands and has options for an additional 65.

engine life that might result from the cooler burning of the low kerosene fuel. But the concern nothing. Finally, an engine engineer, without a warranty from the engine manufacturer that would cause them of longer hours between overhauls. Two, as the engine, there are no problems in the operation of the J17 engine that can be attributed to the current, better burning fuels. Rob-Rosen is interested in the fuel and is believed to be conducting it.

Assessing the other advantages of the low kerosene fuel according to Texaco, as well as the following:

- Low total sulfur content reduces corrosion of hot parts, deterioration of lubricating components, and results in a low emissions index.
- High thermal stability.
- Low freezing point and viscosity rates.

near low temperature fuel flow problems and lower fire risk and jet fuels to refine.

It adds low water in solution, that present fuels as a result of its low moisture content, thus saving the load on fuel system tanks.

Airline officials question whether the new fuel will add to an economic significant enough to offset a possible cost increase of 4 cents per gal. Texaco, without setting any price on the fuel says that it "will make the fuel as economic for the airlines to use."

The petroleum producers themselves are divided on this question. Texaco of course, which produced in this work and has produced over 1 million gal. of engine test, is one that "jet fuels in the future will be used by a large number Number."

But Texaco is a somewhat in-

The NATO lightweight fighter takes off
from a 900 yard grass strip—

climbs at 6,000 ft a minute
with half its own weight in armament ...



...AND BRISTOL SIDDELEY SUPPLY THE POWER

One of the largest manufacturers of motive power units in the world, Bristol Siddeley Engines Limited produce the Orpheus. The Orpheus is the most advanced medium-thrust turbojet engine in service anywhere today and has been chosen for the NATO standard lightweight strike fighter—the Fiat G 94. Orpheus versions range from 4,000-lb thrust dry to 8,800-lb thrust with reheat and reach power/weight ratios of up to 6-1. They are already in service in 6 different aircraft types, specified for 8 others and are flying or licensed for building in India, Finland, Yugoslavia, France, Japan, USA, Italy, Germany.

BES BRISTOL SIDDELEY ENGINES LIMITED



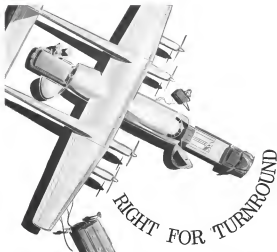
The Rover Sapphire car is powered by a Bristol Siddeley 4-litre engine. Giving strong ground power with exceptional quietness and maximum economy, the new Rover Sapphire has a top speed of over 100 mph and an outstanding all round performance.



The Bristol Siddeley Gamma model engine powers the Standard Sea Hawk. Another highly successful sportsman's vehicle. The Gamma delivers 11,000 lb thrust at altitude for a dry weight of only 700 lb—enough thrust to get 900 miles up into space.



The Bristol Siddeley Marine Power provides the 'thrust' that Royal Navy patrol boats, built by Vickers Ltd. These Patrol boats have a total of 30,000 hp—give these 36 ft boats a speed of over 18 knots.



BIG FORD-AND-AFT DOORS AT PERFECT LOADING HEIGHT ENABLE THE ARGOSY TO LOAD AND UNLOAD WHOLE CARGOES IN UNDER 20 MINUTES

The two you handle simplifies the changing the transport operation. This is true particularly of air freight where quick turnaround is essential. It could not be kept to a mere seven. With the Argosy (AW500) a loading system is being developed that will enable the heavy freight load to be cleared and filed again in a few minutes. With full width doors at either end of the fuselage, the load can be discharged at one end while new cargo is being loaded at the other.

High powered refueling systems that a turnaround can be completed in under 20 minutes. If the Argosy is used for mixed traffic—a role for which it is particularly suited—passenger and freight loading take place simultaneously.

The use of well proven components, particularly the Bell-Bryce Dart prop-jets, guarantees exceptional utilization for most of the aircraft's operations.

| PERFORMANCE | |
|---|------------|
| POWERED BY 4 BELL-BRYCE DART 780P-JETTS | |
| 4200HP/2500000 RPM/11000 FPM/10000 FPM | |
| MAXIMUM TAKEOFF WEIGHT | 100000 LBS |
| RANGE WITH FULL FUEL/RESERVE AND 10000 LBS LOAD | 10000 NM |
| 0-5000 FPM | 10000 FPM |
| 0-5000 FPM | 10000 FPM |
| 0-5000 FPM | 10000 FPM |

THE Argosy BRINGS THE COST OF AIR FREIGHT DOWN TO EARTH

HAWKER SIDDELEY AVIATION,

32 Duke Street, St. James, London S.W.1

SHORTLINES

► **Allegiant Airlines** earned \$1,700 per cargo opportunity, \$10.5 million air air during August, a 21% gain over the same month of last year. Air freight rose 55% over August, 1958, to slightly over 400,000 lb.

► **British Overseas Airways Corp.** and **Quintin Europe Airways** will merge into, through service on their joint-ventured London-Boston route. The latter Oct. 15. Quintin will begin Boeing 747 service, and BOAC will introduce a Hawker Comet 4 service on the route Nov. 4.

► **Continental Airlines** has replaced its last Convair 440 with Viking Viscount 690 on its Dallas-Milwaukee route. The last of three Convairs leased from Frederick B. Aves & Associates has been returned.

► **Hawker Airlines** earned \$2,592 passenger 7,215,000 passenger miles during July.

► **Lockheed Aircraft Service, Inc.** has been awarded a contract for conversion of three Lockheed L-1049 Super-C Constellation from passenger to convertible cargo/passenger configuration. Work will be done at the L-1049 base at Glendale, Calif.

► **Molokai Airlines** reports that it carried 46,482 passengers, 9,115,000 passenger miles during August. Molokai's best was in the air at a total of 1,127 hr and recorded a 90.4% availability for during the month.

► **Northwest & Western Airlines** has submitted a plan to the Civil Aeronautics Board pending for direct air freight service from New York to Tokyo over the polar route via Anchorage, direct service to the Orient and Australia from Boston, Philadelphia, Baltimore, Washington, Chicago and Detroit and from the Pacific Coast cities of San Diego, Los Angeles, Burbank, San Francisco, Oakland, Portland and Seattle/Tacoma. Flights would be operated with 15 Canadian CL-44 turboprop aircraft.

► **United Air Lines** has applied to the Civil Aeronautics Board for permission to operate a weekly service from Chicago to Boston beginning in the summer of 1962. The airline would use Douglas DC-8 aircraft in daily round trip service between Chicago and Boston and would also provide an DC-8 flight weekly from Philadelphia and Detroit to Honolulu via Los Angeles.

AIRLINE OBSERVER

► **Civil Aeronautics Board** declines in the New York San Francisco New York Service (see AW Sept. 7, p. 41) is of major significance to the air line industry, representing the first time that the Board has ruled on a four-wayed philosophy of strengthening routes through increased competition. Sharp dissent on the case by Chairman James Dwyer and member William Davis, declaring that market potential is not strong enough to support a third carrier on the route now has started a policy trend that could have a marked effect on domestic air lines, suggest more cases—perhaps the Southern Transcontinental Case. Although Vice Chairman Chas. Cramer joined with the majority in the New York San Francisco case, he has been a lone dissenter generally opposing increased competition in some previous route cases, and he may lead the opposition to the present route philosophy over both Dwyer and Davis are expected to leave the Board this year.

► **California Airlines**, newly formed and phase dealer, recently purchased 23 transport aircraft from Trans World Airlines for \$5 million and now holds exclusive purchase rights on 27 additional TWA aircraft for approximately \$7 million. Terms of the contract call for immediate delivery of 10 Martin 40-6s, five Martin 2-6s, five Douglas DC-6s and one Lockheed 1049. Several Convair aircraft were recently purchased from Western Air Lines and Northeast Airlines by the acquisition.

► **Lake Central Airlines** will evaluate British aircraft in connection with its long-range equipment program. Company officials will study both the 1-1000 and Hawker Siddeley Aero 748 turboprop transports. Also under consideration are the Fairchild F-27, Alouette's Convair turboprop and the Convair 440 and 440 turboprop.

► **First flight** of Canadian CL-44 turboprop transport ordered by Flying Tiger Line and Southwest & Western Airlines is scheduled for November. Checking of fully installed engine system and electronic equipment is almost completed. Hydraulic system is almost finished and is being checked progressively. Flight controls have been hand-checked. All test flights are now being made. Inspections are now proceeding for repair work scheduled for early next month.

► **East Germany's aircraft industry** announces VEB Kopterfabrik/Lehrwerke for the Flugzeugindustrie has expanded its export drive to include flight instruments and ground installations, as well as the Bielefeld 112 helicopter. (AW, Mar. 23, p. 51). Full-page advertisements in the German Democratic Republic's newspapers offer foreign customers the aid of East German consulting engineers and modern manufacturing facilities for solving aircraft problems.

► **Trans World Airlines** will begin domestic and international all-argo service Oct. 1 with its Lockheed 1049A Constellation scheduled for commercial service for the transatlantic of the company's 100-000th flight with 1049A. An Transport Service. The six aircraft, equipped with two additional 1049A, will provide four weekly round trip all-argo flights on international routes and three daily domestic round trip all-argo flights.

► **Decision** to build the Russian Tu-114 turboprop transport carrying Nikita Khrushchev and his party on their visit to the U.S. this week at Andrews Air Force Base in Washington, D.C. by the U.S. Civil Aeronautics Board was made quickly by the Soviet Federal Aviation Agency agreed to landing conditions on the aircraft.

► **Capital Airlines** negotiations with Air Line Pilots Assn. have broken off after failure to reach agreement on wage increases and changes in the rules governing National Mediation Board will make further attempts to settle the disputed labor claims are strong that the union will opt for other arbitration. Pilots have proposed an exclusive type of pay as an attempt to win pay hikes, hence financial impact on the carrier of present.

Airline Traffic—July, 1959

| | Revenue Passengers | Revenue Passenger Miles RPM | Load Factor % | U S Mail | Revenue | Weight | Total Revenue Ton-Rails | % Revenue In Available Ton-Rails |
|-----------------|-----------------------|--------------------------------------|---------------------|-----------|-----------|------------|-------------------------------|---|
| DOMESTIC TRUNK | | | | | | | | |
| American | 621,074 | 249,220 | 70.3 | 1,073,400 | 95,541 | 8,172,220 | 14,704,670 | 59.5 |
| Boeing | 111,481 | 71,071 | 63.4 | 120,443 | 170,443 | 140,344 | 9,216,691 | 66.4 |
| Capital | 219,291 | 137,139 | 69.5 | 454,340 | 344,340 | 426,340 | 12,307,973 | 60.2 |
| Continental | 102,024 | 70,464 | 68.3 | 120,074 | 14,833 | 226,436 | 7,172,076 | 56.2 |
| Delta | 344,326 | 134,366 | 64.9 | 342,719 | 320,463 | 1,364,662 | 16,196,944 | 56.2 |
| Northwest | 766,940 | 301,179 | 39.46 | 1,015,334 | 104,607 | 1,149,343 | 40,156,911 | 40.50 |
| Trans World | 124,507 | 81,215 | 64.9 | 178,416 | 16,201 | 231,400 | 5,772,703 | 60.1 |
| United | 130,000 | 84,380 | 64.9 | 16,342 | 17,300 | 93,104 | 4,481,948 | 59.9 |
| Western | 144,714 | 106,817 | 69.5 | 140,074 | 140,434 | 1,340,074 | 14,591,486 | 59.5 |
| World | 644,729 | 254,074 | 70.3 | 1,140,434 | 815,486 | 1,415,479 | 40,156,911 | 59.2 |
| Western | 640,436 | 140,146 | 70.1 | 2,311,043 | 1,000,074 | 6,247,074 | 14,242,703 | 60.4 |
| Western | 121,489 | 81,146 | 66.8 | 233,401 | 84,407 | 371,101 | 8,404,407 | 59.8 |
| INTERNATIONAL | | | | | | | | |
| American | 9,440 | 16,474 | 47.5 | 11,500 | 249 | 221,493 | 1,244,144 | 70.9 |
| Boeing | 1,743 | 9,434 | 53.6 | 1,404 | 1,404 | 1,115,441 | 1,180,344 | 70.4 |
| Capital | 21,474 | 2,371 | 71.4 | 1,404 | 1,404 | 1,404 | 246,344 | 74.2 |
| Delta | 4,502 | 5,147 | 62.5 | 1,174 | 1,174 | 14,000 | 440,407 | 66.6 |
| Eastern | 40,419 | 47,466 | 69.64 | 80,700 | 193,101 | 7,344,404 | 40,156,911 | 60.10 |
| Northwest | 100,842 | 20,821 | 49.9 | 1,193 | 1,193 | 31,000 | 2,354,354 | 42.9 |
| Trans World | 4,244 | 3,224 | 61.6 | 5,244 | 5,244 | 45,714 | 440,407 | 60.9 |
| United | 16,436 | 40,407 | 66.4 | 1,102,007 | 34,007 | 1,002,400 | 8,400,100 | 49.7 |
| Western | 4,127 | 7,574 | 71.5 | 22,074 | 141,443 | 107,433 | 407,433 | 49.8 |
| PASSENGER | | | | | | | | |
| American | 13,404 | 16,407 | 67.6 | 213,774 | 1,721,944 | 1,721,944 | 14,407,433 | 66.6 |
| Boeing | 40,811 | 104,344 | 74.6 | 610,000 | 2,007,377 | 14,407,433 | 14,407,433 | 71.4 |
| Continental | 14,404 | 34,411 | 69.6 | 140,100 | 140,100 | 1,004,000 | 14,407,433 | 66.4 |
| Delta | 11,404 | 16,714 | 66.4 | 14,100 | 20,100 | 704,000 | 40,407 | 60.4 |
| SOCIAL SERVICE | | | | | | | | |
| American | 20,407 | 10,411 | 49.3 | 11,774 | 16,774 | 24,407 | 1,007,407 | 49.9 |
| Boeing | 20,411 | 5,104 | 44.6 | 2,411 | 2,411 | 9,277 | 404,407 | 42.7 |
| Continental | 16,411 | 2,444 | 57.7 | 2,411 | 2,411 | 1,124 | 1,124 | 40.4 |
| Delta | 21,400 | 2,071 | 37.1 | 35,400 | 16,400 | 21,407 | 907,400 | 41.4 |
| Northwest | 19,404 | 3,000 | 41.0 | 4,126 | 14,412 | 20,412 | 20,412 | 44.6 |
| United | 40,714 | 1,001 | 4.4 | 1,001 | 1,001 | 1,001 | 1,001 | 44.6 |
| Western | 17,401 | 16,400 | 64.8 | 30,900 | 57,904 | 26,404 | 1,444,444 | 49.4 |
| Alaska | 17,427 | 3,244 | 41.7 | 14,416 | 26,344 | 30,400 | 100,400 | 44.0 |
| Pacific | 16,709 | 9,444 | 56.5 | 1,401 | 1,401 | 1,401 | 1,401 | 38.3 |
| Boeing | 40,407 | 9,444 | 44.6 | 18,416 | 15,719 | 14,414 | 144,400 | 44.4 |
| Continental | 20,404 | 4,144 | 34.6 | 18,416 | 11,416 | 18,416 | 404,916 | 34.6 |
| United | 16,209 | 6,000 | 36.9 | 18,416 | 14,719 | 14,719 | 14,719 | 34.6 |
| Western | 29,404 | 4,144 | 34.6 | 18,416 | 14,719 | 14,719 | 14,719 | 34.6 |
| Alaska | 16,404 | 4,144 | 34.6 | 18,416 | 14,719 | 14,719 | 14,719 | 34.6 |
| MAIL/NEWS | | | | | | | | |
| American | 14,404 | 2,107 | 40.1 | 2,101 | 6,101 | 1,001 | 404,411 | 61.1 |
| Boeing | 14,404 | 11,407 | 62.6 | 2,401 | 1,001 | 1,001 | 1,001 | 41.1 |
| CARGO—LINE | | | | | | | | |
| American | 2,004,411 | 1,004,411 | 50.1 | 1,004,411 | 1,004,411 | 1,004,411 | 1,004,411 | 50.1 |
| Boeing | 1,004,411 | 1,004,411 | 50.1 | 1,004,411 | 1,004,411 | 1,004,411 | 1,004,411 | 50.1 |
| Continental | 1,004,411 | 1,004,411 | 50.1 | 1,004,411 | 1,004,411 | 1,004,411 | 1,004,411 | 50.1 |
| Delta | 1,004,411 | 1,004,411 | 50.1 | 1,004,411 | 1,004,411 | 1,004,411 | 1,004,411 | 50.1 |
| Northwest | 1,004,411 | 1,004,411 | 50.1 | 1,004,411 | 1,004,411 | 1,004,411 | 1,004,411 | 50.1 |
| United | 1,004,411 | 1,004,411 | 50.1 | 1,004,411 | 1,004,411 | 1,004,411 | 1,004,411 | 50.1 |
| Western | 1,004,411 | 1,004,411 | 50.1 | 1,004,411 | 1,004,411 | 1,004,411 | 1,004,411 | 50.1 |
| MAIL/COAST LINE | | | | | | | | |
| American | 10,711 | 270 | 34.0 | 1,101 | 1,101 | 1,101 | 1,101 | 44.0 |
| Boeing | 10,711 | 163 | 14.9 | 1,101 | 1,101 | 1,101 | 1,101 | 44.0 |
| Continental | 10,711 | 270 | 34.0 | 1,101 | 1,101 | 1,101 | 1,101 | 44.0 |
| MAIL/COAST LINE | | | | | | | | |
| American | 11,001 | 12,007 | 69.6 | 61,043 | 2,443 | 404,433 | 1,004,403 | 49.2 |
| Boeing | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Continental | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Delta | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Northwest | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Pacific | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Boeing | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Continental | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Delta | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Northwest | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Pacific | 7,444 | 743 | 37.9 | 2,126 | 1,126 | 1,126 | 1,126 | 40.6 |
| Boeing | | | | | | | | |



VICKERS Vanguard has a span of 118 ft., length of 112 ft., 30.4 in. Still in test stage, speed has been projected to 470 mph.

Airline Week Pilot Report

Vanguard I Demonstrates Single Engine

By Robert I. Strafield

Weybridge, England—Speed and power capabilities—including flight on one engine—of the short-medium range Vickers Vanguard were confirmed during Aviation Week exhibition of Type 951 and in flight test program. Confirmation of the four-engine turboprop by the British Air Registration Board is expected by spring of 1960. Capable of carrying up to 136 passengers class passengers at speeds projected to 470 mph, and with a stallion wing at 2,160 sq ft, the low-wing Vanguard is being produced at a rate

nearly twice that of the Vickers Armstrong (Aircraft) Ltd. plant here. Rate of production may be increased to three aircraft during the latter part of 1960. Cost without S3.7 million, which with spares, runs approximately \$5.2 million.

Power for the first series Mark I Vanguard Type 951 of which three have been produced to date, is supplied by four Rolls-Royce Type 51 engines at 4,580 hp (4,450 shp). Gross takeoff weight of the Vanguard I is 135,000 lb., which is expected to be modified later to the higher operating weight and gross of subsequent Vanguard II's.

Beginning with production airplane number eight, the Vanguard Type 952, Mark II will be fitted with Rolls-Royce Type R.Ty.11 turboprops of 5,000 shp and 5,580 hp. Construction is similar with 10 straight flow-dance blades. Compression ratio is 15.5 to 1. Fuselage length is 105.2 in., base diameter is 211.1 in. The four-bladed de Havilland propeller of 14 ft. in diameter is coupled to the low-pressure shaft through a compound epicyclic reduction gear with helical gear wheels. Reducing gear ratio is 0.064 to 1.

Airline Orders

Both British Overseas Airways and Trans-Canada Airlines have ordered 30 Vanguard each. Initial delivery of the first six Vanguard I's will be to B.O.A. in the spring of 1960. The last 14 of the B.O.A. order will be Vanguard II's, which will be 29 converted for Trans-Canada the first of which is scheduled for delivery early in 1961.

The Vanguard I flown by Avianco, Wixom, Mich. (GAPL), first flown on April 26, 1958, was Vickers' second production model and will be the flag-ship of B.O.A. At this writing the first three production models have each made 160 flights involving 530 hr. total time. Vickers expects approximately



COCKPIT layout includes inspection fuel/gross panel for motor washdown for test purposes. Clearance is 34 sq. ft.

Flight Traits

1,500 to 1,600 hr. before certification. The Vanguard is an attractive airplane larger and faster but also in appearance to the Viscount from which it has incorporated the best features. Vickers chose the double bubble fuselage cross section as the optimum to give the required passenger cabin width and height without compromising adequate wing depth in the wider three-flight bubble.

Basic Construction

All surfaces of the aircraft are light alloy covered, principal structural spars fabricated in L.72, L.75, 24S14 and D.T.D.5078. Magnesium is not used for any skin surfaces. Pressurized fuselage is of conventional construction employing open frames supporting stringers in which the skin is in general riveted.

The wing structure has members of three parts: the outer section and the part and starboard nacelle. Break joints for the assembly of the wings are provided at the wing roots. The leading edges and wing tips are detachable. The fuselage box is manufactured from riveted panels with integral stringers and their spars are clear walls, with chords spaced into forming internal bracing. Each part and starboard sec-

OVERHEAD panel of test aircraft includes flight deck and external lighting controls, driving, fuel system and engine starting switches, and air conditioning regulators.



Vanguard Engine Data

Engines: Rolls-Royce Type 51 To 11, Mark 951

| Condition | Engine speed | Overall | | Overall Fuel Consumption |
|-------------------------------|--------------|---------|----------|--------------------------|
| | | Maximum | Take-off | |
| Max. Take-off (15 min. limit) | 10,200 | 5,500 | 5,240 | 0.444 |
| | | 16,440 | | |
| Max. Continuous (unlimited) | 14,700 | 4,800 | 4,580 | 0.475 |
| | | 14,000 | | |
| Crash (20 min. limit) | 12,000 | 3,840 | 3,715 | 0.388 |
| | | | | |

* (Minimum settings on land, 14.5 min. conditions)

Propellers: De Havilland 14 ft. dia. diameter constant speed full feathering four-bladed

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REAR end panel of the Vanguard contains controls for sensors required during ground test (spotlighted area)

It, during which the airplane was quite responsive to low-speed control patterns, lateral stability was good. Vanguard series has been fully tested with and without power, with maximum stall speed reached being 75 kt. with 70 deg flap and power on.

Noise and vibration in the Vanguard was at a minimum. Flight characteristics were good during all phases and speed regions entered in the evaluation. Control forces were light, and control responded quickly both at slow and high speeds. Particularly effective was engine-out performance.

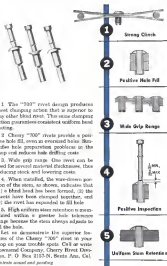
Engine-Out Performance

Web engines turning 11,600 rpm both starboard engines—No. 3 and 4—were feathered at 11,600 ft. Diamond control was held with aileron, and with 5 deg. of flap extended on the Vanguard—with power advanced to 12,500 rpm on the port engine—could be flown hands-off. Augmented at this point dropped off to 700 kt. indicated, for a true reading of 243 kt. at 780 mph.

Lateral control was good and the airplane was pulled into varying degrees of bank, both left and right. We were about ready to return the last power when Jack Korte reached over and feathered the starboard port engine at the same time advancing power on No. 1 to 15,500 rpm (maximum cruise) in this condition, operating on but one outboard the Vanguard continued climb.

Airplane smoothly flew in holding pattern at 150 kt., with or without flap. Flap bursts speed to 100 kt., and provisions call for landing pattern to be flown at holding speed downward, with 20 deg. flap a hole kg of 140 kt. with

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GYRON, JR., sytoid vector will be used in Bristol T.115 all-steel supersonic research aircraft, engine produces 10,000 lb. thrust

Gyron, Jr. to Power Research Plane

London—Modified 10,000 lb static thrust Gyron, Jr. DQ16 turbojet engine will power the all-steel Bristol T.115 high Mach number research aircraft. A new afterburner produces a 4675 thrust boost.

To maintain optimum engine operating conditions in all environments, a variable geometry, constant-discharge jet-puffing nozzle of a multi-pulse type is used. Variation between three basic nozzle profiles is possible, designed for subsonic/transonic flight, parallel for speeds up to Mach 1+ with full reheat and divergent for afterburner flight at high Mach numbers.

Redesigned specifically for flight conditions at high Mach numbers, the engine is fabricated largely from steel and titanium. The compressor is of high exhaust flow design with low high tip diameter ratio. Lubrication system is fuel cooled. Exhaust and exhaust inlet control systems provide simultaneous actuation of fuel flow to engine and afterburner and control of compressor air bleed and engine exhaust nozzle geometry.

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to enhance handling and acceleration characteristics.

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The afterburner can be flame coupled to the engine attached directly to the turbine exhaust ring or a parallel fuel pipe fitted between the engine exhaust cone and the diffuser section. After burner combustion temperature is 2000°C. Engine will be flown in a modified Gloster Jetcraft Mk.1 prior to the first flight of the T.115.

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219 cubic inches. Its critical design requirements are typical of all L.E.A.D. products. Each can be modified to meet many different requirements. Tell us what yours are. Contact our Marketing Branch, Lockheed Electronics & Avionics Division, 6301 E. Randolph St., Los Angeles 22. QV-7010-5-7070

Requirements exist for this and subsequent engines

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MODEL of Avro 748 is in foreground, next to prototype. First flight is planned for February, 12 months after first model was built.

Avro Designs 748 to Sell at \$476,000

By John Tuzovill

Moscow—Avro 748 48-seat feeder aircraft made by A. V. Roe, Ltd. of Manchester, England, is being offered fully trimmed without radio for \$476,000.

To reach this low cost, design, development and testing costs have been reduced by the following means:

- Using systems and equipment of the Vulcani Viscount including its entire

Rolls Royce Dart Mk. 514 power pack.

- Starting with an orthodox, unobstructed structure without welding or refinishing.

- Using existing Argus structural test rigs and tools.

- Requiring accessories and component makers to share development costs by equipping test prototypes at no cost to Avro.

Undercarriage is the only specially developed equipment in the aircraft.

Development time has been cut from Maiden flight in the 748 is scheduled for February next year only 12 months after first model was built.

Besides ease of inspection and servicing built into the aircraft, Avro expects the engines to prove a strong selling point. With a 25,000-hp overhead inlet for Mk. 5 Dart turboprop, it will be tested and it should be inexpensive to maintain. Each engine develops 35,000 shp and is fitted with Rotol 12 ft-dia propellers in supplied to Fokker for the 4-12.

Range-Payload

Gross weight is 33,000 lb and the aircraft is designed to carry its full payload of 9,750 lb over 200 mi, reducing to 4,500 lb over its maximum range of 1,200 mi. Design cruising speed is 250 kt at 20,000 ft where a 51 psi pressure differential gives 5,000 ft altitude cabin conditions. Block speed varies from 175 to 210 kt and cruise costs from 1.75 to 2 cents. Performance data is based on 45-cm. fold, a 200 aust. on discusion plus 5% total fuel reserve.

Avro aims to get full British and U.S. certification for the 748 by March, 1961 and will use two fully equipped prototypes in a 1,800-hr. flight program. Production models are due to roll



PROTOTYPE Avro 748 fuselage is in assembly by aluminum skinning. Frames are secured by locking bolts, locking pins and control.

from December next year at up to two aircraft per month depending on orders. An initial batch of 10 aircraft has been formally authorized by the Hanksley Siddley Group and typeplate wing and landing gear are being set up.

Manufacturing license agreement is being finished out between the company and the Indian government. Agreement has to be reached on the extent of manufacture to be carried out in India. The Indian government is pro-

ving the vague manufacturers for the same manufacturing rights. Avro's subcontract study customer to the British independent airline Skyways which might take three aircraft.

Avro's original bid to enter the civil field with a Dakota (DC-3) replacement was a proposal with a 51 psi air ductage accommodating 30 passengers, gross weight of 35,000 lb and designed around two 1,300 shp turboprops. Variants studied included high and

low wing configurations. A Hanksley Siddley Group market research study, completed last year, showed there was no market for such a small aircraft.

This survey indicated that a Dakota replacement need to be a much larger aircraft. It also showed a marked operator preference for a Rolls-Royce or Pratt & Whitney engine and number of these companies had a developed engine in the 1,000 shp class. In addition, there was a marked preference for a

ARTIST'S CONCEPTION shows configuration of Avro 748 48-seat turboprop transporter.



TECHNICAL drawing shows how to mount into fuselage structure.

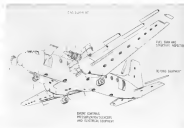


DIAGRAM shows access points on Avro 748. No servicing points are higher than 6 ft off ground, entire port side is fair during servicing for movement of passengers, freight.

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All structural members of fuselage and wing are simulated.

data up to 44 paragraphs it stores up, prevents the wing from bending and fuselage, disintegrates in the DC-5. One reason is the adoption of a fuselage evaluated for most of its length. A head mass of 78.5 is maintained throughout also, and all the equipment and systems are located below the floor.

A 100-lb. high-propeller hydro-ground clearance of 1 ft. was chosen to reduce water damage to the flap, which frequently occurs with smaller clearances.

The DC-5 wing dihedral is also maintained but a roundabout tapered wing section, together with a segment type Fowler flap, have enabled the wing not to be dropped to 755 sq ft. Stall speed, however, has risen to 71 kt.

One feature of the three-position segment Fowler flap adopted is the use of broad tabs hinged along the full leading edge of the flap. The tabs remain unaffected for the first 7-in. deflection giving convenient lift. Over the next 531 deg. deflection of the flap, a mechanical linkage between the tab and the flap track deflects the tabs 60 deg. which puts them perpendicular to the wing chord. The arrangement simplifies the design of the flap track which has only to accommodate a flap deflection of 30 deg.

Landing Gear

The Messier free-fall landing gear is the only one specially developed for the 740. Its novel triangulated strut is designed to retract, without disturbing the wing, from the struts, into a fuselage blower integral with the nacelle.

Also designed here is the spot welding and indexing. Countermark rivets are used only on the upper wing surface and nacelle. Magnesium and high strength steel bearing alloys are also evaluated because of Aero's impression of their track proportion between one long piece. Stress in the fuselage skin (SWG1) is kept below 0.669 psi.

In effect, the Aero job has been



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to assemble a slight weight or drag penalty in the interests of reduced braking action, lower suspension, longer life, and straightforward repair in operation in remote parts of the world.

Avro's principal objectives in specifying the wing structure were to get rid of stress concentrations and the possibility of fatigue cracks, corrosion protection at the welded surfaces. Reducing wing weight, however, without reduction of its strength, saving features would have led to design problems in the form of increased drag penalty on fatigue growth.

A half full-size structure, with 100% steel section, cleaned of all internal structure for inspection of corrosion and cracking, is expected to give 7-10 years service without major structural repairs. Seaming between of both wing and fuselage in the large number of stress points provided. There are 22 in the bottom fuselage box skin alone.

The 745 distributed-load type structure design to avoid load concentration is best illustrated in the integrated wing-to-fuselage joint.

The wing tension box runs fully cleaned through the fuselage, with the upper skin forming the positive ribbing floor. The fuselage skin and tension box are joined continuously through the wing structure and are suitably dished to interface with wing skin and ribs. Straps connecting with the wing ribs are heavily reinforced and are dished over the full depth of the wing ribs. To release the wing upper skin of other pressure loads, struts are placed on both sides to put the skin at the neutral axis of the section.

Each such construction was dropped in favor of a single tension box, with side webs, top panel and shear web.

The main panel over the tension skin, acts as a check strap. This integral main skin, wing skin, and fuselage of the engine wing skin, on third rib acting as a buffer. Aero was a reinforced type of steel ribbed by Thord's patent. Section of 24 in. on each side of the lower wing skin-16 in. wing skin section was chosen in preference to holes in the wing webs on grounds of stress concentration.

The multiple load ribs feature in the bottom skin is achieved by dividing the skin chamber into four panels. Fuselage details show the use of stress-integrated struts and tension with the fuselage dished to the skin between the struts. Both the fuselage and the wing are made in one piece. Stressed joints increase weight and costs, Aero says, and also lower the fatigue life of the structure.

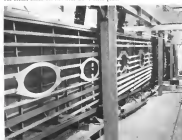
All the Avro 745 engines and engine equipment are located below the floor and can be serviced simultaneously.



COMBINED part and airframe wing jig for the Avro 745 at above: a wing-fabrication section is shown before being assembled in separate jig of Avro factory in Manchester, England.



EACH LOWER WING SKIN of the 745 has 17 inspection panels which provide 100% visual access to the ribbed structure for inspection of corrosion and cracking, Aero says. The bottom tension box skin alone has 22 stress panels.



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and, thus, we have determined along the fuselage. All ground connections are made in the nose wheel bay which also houses the hydraulic equipment. Nose gear and bellows are in the nose section, instrumentation and electrical equipment are housed in two bays forward of the wing, electrical flap gear and basic mechanical equipment are in the wing root and the flight controls are serviced in the tail cone. No servicing point is higher than 6 ft. off the ground, and the entire port side of the aircraft is free during very intensive operations for the movement of passengers and freight.

Although the landing gear is arranged for free fall, hydraulic lowering is provided. Tire pressure has been kept low—45 psi on the nose and 90 psi on the main wheels. Tires are electrically operated and a deflated tire can be replaced by "ring main" torque tubes.

Other specification details: Length 67 ft., wing span 55 ft., aspect ratio, 11.352; taper ratio, 0.368, height 34 ft. 9 in., passenger cabin length, 46 ft. 6 in., fuel capacity 3,121 cu. ft., baggage external dimensions, 5 ft. 10 in.

Hypersonic Tunnel Permits 15-sec. Test

Washington—Wave superheated hypersonic tunnel for long-duration testing of hypersonic nozzles and other slender bodies will be constructed by Cornell Aeronautical Laboratory under a \$5.1 million contract with Air Force's Air Research and Development Command. Funds were provided by Defense Department's Advanced Research Projects Agency.

The tunnel, believed to be the first that will permit sustained, heated tests of hypersonic flight, will be located at Cornell's main research center in Ithaca, N. Y., and is scheduled to begin operation in about two years.

Under the contract, Cornell also will complete engineering and design work on the wave superheated which will be used to supply high temperature, high velocity air flows for the tunnel. A pilot model of the superheated was developed several years ago under previous contracts with the USAF Office of Special Research.

The new installation will generate pressures of approximately 18,000 psi and temperatures of 9,000°F for 15-sec. test periods. Present aerodynamic test devices producing hypersonic air flows and temperatures can be operated for a few thousandths of a second only.

The development program will be conducted by ARDC's Aeronautical Engineering and Development Center at Dayton, Ohio.



Reliability is Everybody's Business

About a hundred years ago Charles Babbage drew up a workable design for a computer which employed the principles on which all modern electronic computers are based. He spent his own substantial fortune attempting to build it. A little hesitancy in machine tolerances prevented its completion. He died an embittered old man.

The tragedy of Babbage's life was that machine tool design was not far enough advanced to produce parts with the accuracy his design required. How often is a similar tragedy enacted today? Feasible systems are unworkable when components of the required standards are not available. But a greater tragedy lies not so often in the state of the art of components fabrication, as in failure to produce the components which the art permits.

We must all share responsibility when a weapon system fails. Reliability should be a prime concern of management in establishing its policies, of engineers in creating their design, of the manufacturer in producing, of quality control in verifying production in accordance with design and of the purchasing department in procurement.

Let's define reliability and make it our job.

George J. Pendley

George J. Pendley
President



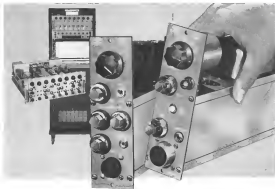
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-per inch
-per dollar
-per channel



SPECIFICATIONS

| | 850-1100A | 850-1200A |
|------------------------|--|--|
| Accuracy | 100 μ in/gauss 1 in at output | |
| Input impedance | approx. 1000 ohms | approx. 100,000 ohms |
| Output | 2.5 to 50 mV at 100 cps | 0.2 to 10 mV at 100 cps |
| Resp. range | -1 db at 10% of center freq. | flat 10 cps - 100,000 cps |
| Linearity | $\pm 0.2\%$ of full scale | $\pm 0.1\%$ of full scale |
| Common mode rejections | 100 db for 100 cps, 100 db for 10,000 cps with 100 cps common mode | 100 db for 100 cps, 100 db for 10,000 cps with 100 cps common mode |
| Notes | 1. Can give more than 100 cps. 2. Can be used in a range without effect. | |

(Note subject is change without notice)



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AVIONICS



Bell AH-1G attack helicopter is fitted with electronic suite for mapping and forward obstacle information displayed through a new cockpit. Assault is a Bell AH-1G turbine-powered helicopter produced for U.S. Army.

Army Studies New VTOL Instrumentation

By Ewen J. Redden

DeMo.—Development of helicopter and vertical takeoff and landing (VTOL) aircraft into major weapon systems providing the capability of completely mobile units is a vital U.S. Army requirement to match a rapidly growing Soviet army threat in this area according to Brig. Gen. Ernest F. Eustachy, commander, U.S. Army Aviation Center, Ft. Rucker, Ala.

Information received by the U.S. Army indicates that the Red Army is aware of the value afforded in the use of helicopters in part of a modern army to give tactical surprise and provide operational shifts. Gen. Eustachy told delegates to the Fifth Year Navy Instrumentation Program Symposium.

Secret Plan

The added '70's also show that the Soviets are pursuing an active program of "strong helicopters." The general pointed out that there were signs the Russians deployed at Tundra Airport, near Moscow, three Huey helicopters generally comparable to the U.S. Army's HH and the Huey which he approximately 50% more than the Moscow H-17, carrying the nation's largest operational helicopter.

Gen. Eustachy, noted that the U.S. Army is experimenting with the first phase of a new method of warfare by a unit fully equipped with

integrated aircraft under its control. That the aerial unit and some sensor company and the reconnaissance and security company, provide looking and firing of the enemy so that other missions can be taken to do the fighting.

In basic, mobile units will be available to engage in the actual fighting itself, he added.

For mobility of firepower, he said, and certain mobile units being completely available with VTOL aircraft so that it can move in a predetermined position, deliver a few seconds and then disengage, before enemy counter-attacks can be mounted. Within the present state of development he said that it appears that a specific requirement exists for an aircraft to reconnoiter and destroy enemy VTOL and STOL aircraft. Such aircraft must have the ability to match VTOL and STOL aircraft and fly at extremely low altitudes. VTOL aircraft will necessarily engage each other in combat. Gen. Eustachy stressed, in one side on discussion to secure and defend and the other force two to reconnoiter.

Key to the entire Army program of integrating, mobile, transport reconnaissance, detection and firepower in the equipment being developed under the Army Navy Instrumentation Program (ANIP), the approximately 1,000 participants from the services and industry were told.

Then, you evidence that the program, on which the services have spent some \$37 million to date, has provided significant large technological steps in data collection, computerization and precision equipment which is already finding its way into cutting advanced aircraft projects as well in providing the components which will make up the final concept of cockpit presentation in the future.

Technological Components

Latter's RUI 2 computer, which is in the Bell AH-1G helicopter, features some 100,000 words of data in development from the ANIP program, such as in using various electronic recording system providing complete compatibility with transmission components and log file. (It has recorded 10,000 words in two hours operation). It began operating in a method combining the best features of incremental and whole-memory techniques, eliminating the drawbacks encountered when using these techniques separately. RUI 2 computer will provide linked navigation features and cruise control management keeping accurate track of amount of fuel consumed regardless of the aircraft's flight pattern, and also watch loading to calculate at any time the safe maneuvering limits of the aircraft.

Latter's RV 7 advanced cockpit control computer, which will go into Bell's AH-2 attack helicopter as part of the



NEW CONCEPT: The S-60, prototype for future Sikorsky flying cranes, now is demonstrating in flight exciting new ways to handle both military and commercial materials and construction billings.

NEW POWER: Sikorsky flying cranes will utilize high-powered gas turbine engines, affording every advantage with its favorable power-weight ratio.

GREATER CAPACITY: The prototype S-60 lifts 5 tons with ease, with its two 2100 h.p. Pratt & Whitney Aircraft R-2800 piston engines. Turbine-powered models in design will carry from 10 to 40 tons of payload.

ALL-PURPOSE DESIGN: Cargo lifting is simplified by design that streamlines the load, specialized pods will speed movement of personnel and of communications, maintenance, and medical equipment, and will answer many other periodic needs.

SIKORSKY AIRCRAFT, Stratford, Connecticut

Sikorsky S-60
—giant new
flying crane



MOCKUP of RH-2 cockpit (left) has fuselage, sensor part of a perception system developed by North American's Autonetics Division. Image courtesy of a person shown by an optical-mechanical projector and appears in a flat earth plane with antenna horizon. Future changes will, altitude, roll, pitch, heading and velocity. At right is a proposed Douglas/Squadron Division advanced ANP cockpit in mockup form. It is a further development of a cockpit system shown in T3V-1.

ANP program utilizes Vane-developed microprocessor techniques and has been demonstrated in a package of less than 2 1/2 cu ft weighing some 55 lb. It provides data for horizontal, vertical, azimuth and magnetic display and automatic control. Microprocessor is enabled with providing solutions of 10 to 100 times that would be required using conventional circuits. As a further extension of its research program, Vane believes that with application of deposits on defense film, current microprocessors which could be reduced in size on release on the order of 1,000. Vane display showed current microprocessor boards 12 mils thick, he said, each again only containing a circuit of 22 components.

Bell demonstrated its RH-3 research helicopter, a modified Navy HTL-7 fitted with a contact analog display system with a transparent glass presentation. The glass is a tridimensional, etching as a filter which reflects color of the light spectrum and permits all other colors to pass through part of a perception system developed by North American's Autonetics Division.

The projected range is a grid pattern formed by optical-mechanical projector designed and built by Bell. The pattern is changed in attitude by signals from a Bendix-Pacific sensor attached to roll, pitch and heading by signals from conventional optical and mechanical ground and in velocity by signals from a Bendix display radar. Vane provides the pilot with 30 deg. of total scan. According to one Bell pilot engineer on the RH-1 program, only one of the subjects who have flown the system has failed to bring the helicopter back to a normal position

after it was put into an unusual attitude and he also failed when trying to correct using conventional visual means.

A more advanced system is planned for the Bell RH-2 research helicopter, a modified HU-1A turbine-powered aircraft. RH-2 system includes Bendix Pacific three-dimensional radar set and a Denham radar data converter and television monitor. The radar is a high resolution K band monopulse system designed to provide two-dimensional ground mapping and electric data.

The scan antenna provides data for ground mapping (DVE) presentation in

the conventional manner and also illustrates terrain for the change viewing feature. Globally viewing system is based on use of prism plane compression technique, based on a plane based on terrain, two induced motion two 45 deg. and a plane computer. Plane compression technique permits vertical angle of the return of energy to be monitored, while time of arrival difference maps. Vertical angle and slant range information is compensated with azimuth angle derived from the system bearing, deflection coordinates which determine the location of the radar return in three dimensional space.

The radar data converter is designed to accept C-band radar data information and convert it into signals required for display on the television monitor. This is basically done by using the radar information on one of two channels, radar video scan rate, and at the same time periodically stored information is being read out from the second tube at a 60 frames per second rate.

This picture on the monitor will present information on the video within an amount of 20 deg. on either side of the flight path elevation of 300 degrees above and below. Range perspective provides scan elevation in height, velocity and further depth with induced brightness, over a 1 sec. range.

Other equipment will include an indicator of a Litton RW-2 computer to provide navigation, altitude of light and fuel management information and a television control and electronic control action for various modes of control. System would change in evaluation is carried out on the various equipment and new applicable equipment appears for installation.



Cryostat Test

Superconductivity is achieved in control test of components for electronic communication unit systems of Space Gyroscopic Co. Space is producing communication equipment for Boeing's B-31. In the test above the cryostat has been brought to a temperature within 1 deg. of absolute zero—near 0°K.

INFRARED SYSTEMS AT HONEYWELL

Intensive research, development
and manufacturing efforts are now
being applied to these important
areas of technology.

Space Navigation—Minnesota Honeywell is exploring the role of optical and infrared devices in the navigation of space vehicles in cislunar and interplanetary space. These devices are being considered in terms of their own capabilities and their integration into navigation systems involving other areas of sensing such as inertial and radio.

Horizon and Gaze Scanners—An infrared sensor shows the earth (or accurately detects a horizon) by sensing the change in radiation as the field of view sweeps across the horizon. Angular measurements of two opposing horizons can give altitude and oriented orientation. Such a horizon scanning system is designed for integration with Honeywell inertial gyro or precision gyro platform reference systems. It is adaptable to star scanning for altitude and range measurement.

Navigation Systems—Currently under development are star tracking systems which will provide accurate navigation in space. Honeywell is developing a gimballed star-tracking system capable of day and night tracking of astronomical stars. Its accuracy is comparable to that of the most advanced gyro platform reference systems. Gyro stabilization and precision digital readouts are important features of the design.

Detection Systems—Work is in progress on infrared target detection acquisition and tracking systems. Current activities concern long range detection of ballistic missiles and air-borne location of submarines. Other areas of activity involve battle field surveillance problems, such as detection identification and location of typical bank field targets.

Fuzing—Honeywell currently has in production an infrared fuse for an operational aircraft missile. The company is working currently on the development of a variety of other infrared fuzing systems.

Honeywell provides full computer support for infrared systems with the research, development and manufacturing facilities from 34 computer divisions. Honeywell has same experience in the areas important to the successful applications of infrared than any other company. These

include the manufacture of infrared cells, optical equipment and films, plus extensive experience in navigation and guidance systems and systems management. Other related Honeywell capability involves data processing, testing and digital computer and receiving equipment.

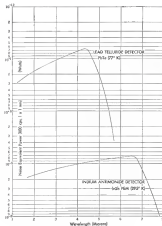


Chart above shows the spectral
response of two Honeywell
detectors—heart of infrared
systems—described and
pictured at right.

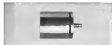
For further information on Honeywell infrared systems and components, call or write Honeywell, Military Products Group, Minneapolis, Minnesota.

Honeywell
Military Products Group



Lead Telluride Detector—Honeywell's photoconductive lead telluride (PbTe) detector operating at the temperature of liquid nitrogen, 77° Kelvin, has its peak response at 4.5 microns. At this wavelength, a detector with a 1 mm² sensitive area is capable of detecting 7 x 10⁻¹⁰ watts with a signal to noise ratio of unity at a 3 cps bandwidth at 800 cps. The response time is no greater than 50 microseconds.

Cryogenics—Many sensors require cooling so low temperatures for full effectiveness. Honeywell has designed a tiny cryostat which fits inside one can or other cells. When attached to a compressor or tank of nitrogen, it cools the cell to 77° Kelvin in less than two minutes. It has a diameter of .177 inch, a flow rate of two liters per minute at an input pressure of 2,000 psi and a heat exchanger one inch long. A small compressor system is being developed for spot cooling to 50° Kelvin.



Indium Antimonide Detector—Honeywell's solid-state antimonide photoconductive (InSb, PIM) detector requires neither cooling nor bias supply. It is extremely fast, having a response time of less than 0.6 microseconds. Although it is less sensitive than the lead telluride detector to high temperature radiation, its noise equivalent power of 7 x 10⁻¹⁰ watts for a 1 mm² area at 6 Hz makes it a 3 cps bandwidth detector greater sensitivity to sources of radiation near room temperature. Its response frequency is independent of frequency out to several hundred kilocycles per second, making it of great value in wide band applications. It is finding wide application in systems demanding long wave-length response, rugged construction, and simplicity of operation.



The man:

... a top echelon scientist at White Sands, N. M., stands ready when preliminary Nike Zeus tests take place. He is a key member of the highly specialized military-civilian team that is putting this anti-missile missile through its development stages.

When Zeus goes on active duty, it will follow Douglas Nike Ajax and Hercules missiles into service with the North American Air Defense Command. And it will be accompanied by Army personnel stationed by Douglas field service men who have extensive experience in the Nike program.



CLASSIFIED

The missile:

... Nike Zeus is being developed by Douglas under a Western Electric-Bell Telephone program. System will include electronic detection gear to pick up enemy ICBM's at extreme range and then guide Zeus out to destroy them. Vital statistics: CLASSIFIED.

The mission:

... anti-missile defense Zeus will come out from underground, second cities and industrial and military areas to intercept approaching enemy ICBM's... or bombers.

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Space Data Relayed by Digital Telemetry

By Philip J. Klaus

San Francisco—First details on Teletel, the new digital telemetry system designed specifically for the difficult task of reliable transmission of data over uncooperative data-links, were reported here during the Western Electronic Convention (Weccon) by Dr. George E. Mueller of Space Technology Laboratories.

Teletel, first used aboard the recently launched Explorer VI, is a time-driven multiplex system developed by Space Technology Laboratories under Air Force sponsorship. Another digital telemetry system for interplanetary space vehicle use is being developed by Space Electronics Corp., under sponsorship of Jet Propulsion Laboratory and National Aeronautics and Space Administration.

One significant advantage of the new digital system over earlier analog type telemetry was demonstrated here during Weccon. Within 15 min. after Explorer VI had been reintegrated by a shakedown in Manchester, England, the recorded data had been transmitted to El Segundo, Calif., where it was decoded and processed by a digital computer, then relayed by teletype to the Cape Priests, site of this year's Weccon.

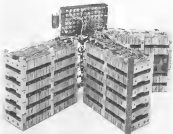
Automated Systems

Teletel is the first step, Dr. Mueller said, toward the full utilization of digital techniques in the development of fully-automated communications systems for deep space probes. Mueller, who co-authored the report with STL's John E. Taber, is vice president and associate director at STL's research and development division.

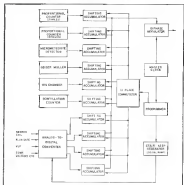
Here are some of the advantages of digital modulation techniques for deep space probe telemetry cited by Dr. Mueller.

• **Greater efficiency.** Digital modulation makes more efficient use of a low-power radio transmitter carried by the space vehicle. For example, at least detectors, a Teletel system using a 100 milliwatt radio transmitter can handle 5 bits per second, roughly 16 times the information rate of the FV-PMV system used in the earlier Pioneer lunar probes, Mueller said. Teletel is only 10 db above the Shannon limit of the area when engaged in error-free data transmission, according to Mueller.

• **Flexible information bandwidth.** Rate at which data is transmitted, he said, can be varied as desired from the earth to permit higher bandwidth when the vehicle is relatively close to the earth, and reduced bandwidth at greater distances. Teletel system used on Ex-



TELETel is now operating aboard missile launched Explorer VI. The 11 lb. package, shown above in expanded component configuration, converts experimental measurements into suitable pulse coding for transmission back to the earth.



BLOCK DIAGRAM of Teletel base-station multiplex telemetry system used aboard Explorer VI. Shows how shift accumulator's output signals are expanded by commutator and then fed to the display modules.

When the commander of a B-52 gives his Strategic Air Command order to execute this or that mission, the control system of his "electronic co-pilot" automatically applies just the right force on the control surfaces to obtain the desired maneuver under the prevailing flight conditions. That's automatic flight control at its finest!

Dynatron Transducer helps provide the calculated muscle for this flight system in the form of servo controlled pitch, roll, and yaw follow up; coordination misaligner; and pitch integrator.

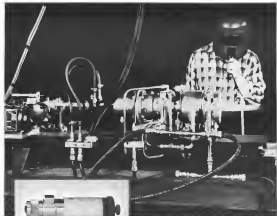
The engineering and manufacturing assistance you need to turn modern system requirements into operational working sub-systems and assemblies is the very basis of our business. Contact us direct or through our local representative. Check into our 24 Hour Service on servo motors and generators. Daystrom Transload, Division of Daystrom, Inc., Worcester, Montgomery County, Pennsylvania. (Phone: JUNE 4-2421)

Neuroesthetics in Canada and Other Foreign Countries

The Tekbit system used in Explorer VI employs a 10-bit word length, permitting an accuracy of one part in 1,024 if required. Discussion notes of the analog data experiments in Explorer VI do not require this degree of accuracy. For some experiments, the data can be



Continued
Commute
from
Pre launch
through
Recovery



Are gases (top) by Arco Model PG-500 Plasma Generator (bottom), duplicate among heat of re-entry. Operating simplicity of Arco Model PG-500 (right) permits use in the development of plasma drive technology. Lightbulb, inserted only for light.

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Arco Model PG-500 Plasma Generator, operating at one atmosphere of pressure, produces enthalpies from 250 to 12,500 Btu/lb, consumes up to 1.5 megawatts of power, runs air as the working fluid and incorporates over two years of re-entry simulation experience. PG-500, producing heat fluxes and temperatures on a customer basis formerly attained on an intermittent basis in the shock tube, now provides the long running times so necessary for materials development.

Another unit in the Arco-developed family of plasma generators, Model PG-200, consumes from 2 to 30 kilowatts of power and produces temperatures over the range from 2500°F to 12,000°F. Model PG-200 is used for development of plasma entry technology and aerodynamic studies. Using argon as the working fluid, it is capable of virtually unlimited operation at a power level of 35 kilowatts. Model PG-200 is especially suited to low cost

operation and features automatic starting, a high degree of controllability, quiet operation and shop-type reliability.

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Research & Advanced Development



quency is captured with six bits or less. This makes it possible to double up and use a single 1-bit word to transmit data from both a sublet experiment and a fuellet experiment. Each Tekbit word also contains two synchronization pulses—a zero and a one.

The segment of digital words transmitted, representing a collection of all the experiments being conducted, is referred to as a "frame." For Explorer VI, a frame consists of 10 words plus a synchronization word.

Each of the digital words is accumulated, or stored, in its own transistorized shifting accumulator. For Explorer VI, there are 10 shifting accumulators. Each word has four feedback. In case the data is a binary number, it subsequently, upon cessation, to deliver the binary data in sequence to the playback oscillator. The read-out of each shifting accumulator is controlled by a transistor and commutator in turn controlled by a timing clock oscillator.

For experiments in which the data rates extend slowly, permitting a slower sampling rate, a suboscillator can be employed to alternate with the input or use shift accumulators to the output of each of several such slowly varying experiments. In Explorer VI, a 16-element suboscillator is used for such circumstances as vehicle temperature and the output voltage from altimeters.

Spac Electronics Corp. is solving the fast portage of its new Digibit receiver system for tests like Thor, Digibit, as a bidirectional multiplex system which also can peak a variable data rate. It will employ an orthogonal set of Reed-Muller pulse codes and data can be recorded in an desired degree of accuracy.

Base system is designed for 32 quantized levels, but is adding a less complex plug-in module, it can be modified to operate as low as 5 or as high as 770 quantized levels.

Comparing phase to use phase-locked circuit technique, similar to those employed in carrier telemetry (FMPS) and low altimeter system. This will make it possible to either coding ground system equipment except for directional sense circuitry which may be changed to handle the digital modulation.

Following developments will be reported at annual Western Electronic Convention (Wencon) in San Francisco.

► **Address: Micro-Test Tech.** Space-Highs Aircraft will soon start flight tests on a ground-based electronic collection system when operating

at the 10 air target. Both frequency shift (FSK) and phase modulation techniques will be evaluated. Airborne telemetry power will be 10 kw.

► **New Computer Storage Techniques—**Switching time of basic memory core can be decreased by factors of 10 by using short-duration high peak amplitude pulses. Vincent J. Striano of Lincoln Laboratory, reported at Wencon. Using new, rapid switching technique, Lincoln Laboratory has demonstrated 1.040-ns bit length word storage, organized as a linear solution, sequential access memory with a read/write cycle time of 1 microsecond and a sequential word access time of less than 1 microsecond. Striano reported.

► **Semiconductor Capacitors—**New technique for making variable capacitors from semiconductor crystals, which permit a significantly greater range of usable capacitance variation, was reported by John L. Moll of Stanford University. Device controls of N-type silicon, enclosed with thin layer of silicon monoxide, in which a metal film is deposited.

► **Micro-wave Oscillators—**Small microwave tube, called the Hittman, which requires only a 1.1 change in beam voltage to produce a 2% change in frequency, was described by George Wachs of William-Johnson Co. and Richard E. Hottel of Stanford University. One experimental laboratory, built by William-Johnson Co., had a tuning range of 400 to 1,500 mc in a change range of 770 to 1,530. Output power varied from two to six watts with a 3 db bandwidth of over 100%. Tube weighs 16 lb, measures 16 in. in length.

► **Superregenerative Transistor Amplifier—**Superregenerative operation of a single-stage transistor amplifier can be used to increase bandwidth by a factor of 10 to 100 over conventional pentode type, as well as increasing gain and gain stability according to J. J. Young, A. G. Little, H. Hottel and G. Wachs, all of Stanford University. To achieve superregeneration, amplifier is pumped and coupled to come it to oscillate and the oscillations are subsequently attenuated as they decrease, build up and do not. A special method of superregeneration is a modulator independent of the effects of the Hittman used in a pumping circuit. Improved pentode amplifier operating at 750 mc achieved gain of 36 db and to 40 db bandwidth of 2 mc, when operated in superregenerative fashion, compared to gain of 13 db and a bandwidth of only 100 mc when operated in a conventional regenerative type amplifier.



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QUEEN BEE Model 2 seen in mid-flight. Federal Aviation Agency certificate lists wing planar wing tip fold.

Queen Bee Aimed at Medium Price Range

San Diego, Calif.—Two Connecticut Design men are putting a new four-place single-engine business plane through Federal Aviation Agency flight tests with a view toward selling the plane two rights to an established manufacturing.

Designed for the "medium-price" market, the 2,190-lb. gross weight Queen Bee features wing-tipped control surfaces and use of riveted-plastic assemblies to keep production costs down. Designers William F. Conrad and Ken S. Conrad report that an Australian manufacturer is currently in design of the airplane and that several U.S. firms



AIRCRAFT has metal wing skeleton. Control is designed for high visibility.

have also made manufacturing studies of the Queen Bee.

Both men are in Connecticut San Diego's military aviation department. Conrad is president of his aviation and Conrad is vice president engineering. This is the third personal aircraft project developed by them. First was the gyro-tilted Wing Bee; then came the gyro-tilted Wing Bee; then came the gyro-tilted Wing Bee.

Construction of the Queen Bee is principally metal, with reinforced plastic used for wingtips, which form all of the plane's 60 sq ft of wing. The wing uses a single bulk of which is completely removable, the tip of the V tail, the cockpit canopy, the instrument panel and tail cone.

Wing tips are continuous from fuselage and comprise 85% of the airplane's total wing area. Wing tips are, like

HOW TO GET 160 MILLION AMERICANS OFF THE GROUND ...AT A PROFIT!

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modern, turbine-powered equipment that offers competitive speed and comfort advantages plus two other very important features. They are: (1) *especially* to absorb more passengers, and (2) *proven economy* which assures that reduced fares can be profitable.

It has been demonstrated again and again that the jet-prop offers the best combination of passenger appeal, routing flexibility and economical operation—as all ranges from 100 to over 1000 miles. And these are the ranges which include 70% of all American air travel!

On the following pages are two new aircraft that meet these vital jet age requirements for short and medium ranges—and to a degree unmatched by any other airlines.

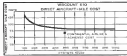


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After six months of service, Continental Airlines reported a plane-mile cost of only 73.33 cents—11 cents or 15% below estimates—for an average 360-mile route. In fact, the new Viscount 810 proved so economical that Continental showed a \$1.8 million net profit in just seven months with an average fleet of only one aircraft!



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HIGHER PROFIT MAKING FOR PROMOTIONAL FLIGHTS

With seat-mile costs as low as 1.66 cents at 360 miles and 1.34 cents at 500 miles, the Viscount 810 opens the door for airlines to initiate promotional fares—and other traffic-stimulating plans. Promotional fares are being widely advertised as the surest method of broadening the base of the American air travel market. Today, that market is only 10 million. But there are 100 million more Americans waiting to be won over. In its size and class, the Viscount 810 offers a marvelous combination of passenger appeal, loading flexibility and economy that can be used most effectively to attract substantial new traffic.

WORLD'S ONLY 34' CORRIDOR JET AND AIRLINES!

The Viscount 810 and Vanguard benefit from the same line 34' entry base of worldwide airline experience of over 400 Viscounts. And there is no substitute for experience!



SEAT-MILE COSTS UNDER 1¢

60 passengers—20,000 lb payload—475 mph—1,000-mile range

The loss of the American air travel market must be recovered. The giant Vanguard, now proving its mettle in the skies over England, is the jet age airline best able to do it profitably. No other aircraft—jet or jet-prop—surpasses Vanguard's combination of high capacity and low operating costs. Seat-mile costs can be under 1¢ on all routes from 1600 to 2000 miles—and only 1.4 cents at 360 miles.

LARGE, BALANCED PASSENGER CAPACITY ... In addition to a comfortable capacity of 120 seats, Vanguard offers 1300 cubic feet of cargo space below decks. With baggage for 57 passengers, plus 400 lbs. of mail, there is still 945 cubic feet available for freight. Here is capacity that is profitable today—and will be even more profitable tomorrow as load factors grow.

EXCEPTIONAL ROUTING FLEXIBILITY ... At all altitudes from 3000 to 25,000 feet, Vanguard can be operated in any-weather flight. For example, a 300-mile sector from 10,000 feet costs only \$44, more than at 25,000 feet.

(equipment). A speed of over 400 mph is attained at altitudes from 3000 to 25,000 feet. In addition, ATC patterns will present no problems—physical or financial—for Vanguard operators! And the Vanguard has demonstrated that it can meet—or even beat—jet schedules as routes up to 3000 miles.



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VISCOUNT 810/840

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VANGUARD

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PRECISION POTENTIOMETERS TAKE?

Special Kelty sector potentiometers have been designed to operate in ambient temperatures up to 500° F.

Kelty precision single-turn, multi-turn, reticle and sector potentiometers for control and instrumentation purposes feature accuracies and high sensitivity. They are custom engineered for applications such as radar line sweep because of shock, vibration, torque, resolution or destructive environment.

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Advanced Manufacturing Technologies—such as the ability to weld tape to a single turn of wire as small as 0.0064" diameter (1/16 the diameter of a human hair).

Kelty potentiometers are being produced in a wide range of types and sizes, from tiny precision pull-offs to complex function and multi-wiper units.



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MULTI-TURN
RETICLE
SECTOR
TAPERED
2" DIAMETER
2" DIAMETER
2" DIAMETER
2" DIAMETER
2" DIAMETER

Circle 10 on Reader Service Card

WHO'S WHERE

(Continued from page 23)

Changes

Dr. Wilhelm Rindler, management planning Special Projects Section, General Electric Co.'s Defense Systems Department, Philadelphia, Pa.
Leonard Carl Vogel, head of Aircraft Ground City's Liquid Rocket First Field Operations Staff, Vandenberg AFB, Calif.
Frederick B. Ayer & Associates, Inc., New York, N.Y., has announced the following appointments: Bert K. Gossin, assistant sales manager, A. Suber & Associates, 1000 representative, London, Calif., director of sales, General Aero-Lux Division.

Frederick H. Hanson, factory manager, Bendis, Tulsa, Okla.; Bendis Aviation Corp., Madison Heights, Mich.

Ernest Anglin Co., Seattle, Wash., has announced the following appointments in the new Aero-Space Division: Robert H. Jovett, general manager engineering and product development, and W. W. McLaughlin, general product manager; Kenneth W. Brown, general manager operations; Edward W. Nelson, factory product administration; R. W. Thompson, director; Bruce Wesley M. Maddala, director planning; John E. Maddala, Jr., director administration; Stanley M. Little, director industrial relations; and A. L. Long, assistant director. Robert S. Winfield, public relations man, APT.

C. A. Polge, sales manager military equipment, Matthews and Sessions Division, General Corp., Secaucus, N.Y.

C. A. Rasmussen, chief engineer, Columbia Engineering Company, Inc., Tacoma, Calif.; also R. D. Finkler, director of customer relations.

Dr. Herbert A. Berry, head of the Human Factors Section, Navy Tactical Operations Control Project, Computer Operations, Armstrong, a division of Ford Motor Co., Newport News, Calif.; also Joseph K. Ray, emergency product planning, for Computer Division.

George F. Kennard, assistant branch and district manager, Division of Dr. Thomas R. Blanton, manager, System Analysis Department, Project Services Division—International Business Machines Corp., Chicago, N.Y.; also Joseph D. Fitts, manager of manufacturing; Theodore J. Lohrke, manager of quality and reliability; Kenneth B. Doyle, manager of product engineering.

Dr. John P. Nade, director of research, Lockheed Models and Space Division, Palo Alto, Calif.

Thomas E. Regan, general superintendent of manufacturing, North American Aviation's Missile Division, Downers Grove, Ill.

Thomas W. Marston, director of engineering and research, SKF Industries, Inc., Philadelphia, Pa.

Donald B. Bennett, assistant manager of the engineering department, Rhine, Stevenson, Inc., Van Nuys, Calif.

Dr. Louis Muller, head of a new Vietnam Technology Division, Vetus Associates, Palo Alto, Calif.

FACTS the aviation industry should have on commercial uranium

Uranium has many interesting properties.

For example, Davison Uranium has exceptional strength in air at 900° F. and will not oxidize or melt. The inherent weight in uranium is so high that it is used in aircraft engines to make engines lighter and more powerful. It also makes a very good neutron moderator, and is used in nuclear reactors to produce power.

It also makes a very good neutron moderator, and is used in nuclear reactors to produce power. It also makes a very good neutron moderator, and is used in nuclear reactors to produce power. It also makes a very good neutron moderator, and is used in nuclear reactors to produce power.

Is Davison Uranium easy to fabricate?

Davison Uranium may be melted and cast into any desired shape. It may be formed by extrusion, drawing, rolling, forging, pressing or stamping.

Is Davison Uranium expensive?

Yes, it is. For example, in lots of 100 pounds or more, Davison Uranium is priced at just \$4.00 per pound—considerably cheaper than other heavy metals, with the advantage of superior strength.

How about welding?

Success in welding Davison Uranium has been achieved using the inert gas and shielded arc-welding electrode process. At this date, experiments continue in joining uranium to titanium by brazing or soldering.

How has Commercial Uranium been used?

Present applications in the Aviation Industry are concentrated in the use of stable isotopes. Applications in other industries include shielding materials, radiographic films, isotopic containers. And for many years, uranium has been used as color agent and glass.

Is Davison Uranium safe?

Enduring through all major AEC tests include a 100% exposure to depleted uranium is only about 1/1000 of 1/10000 the radiation received from an ordinary chest X-ray.

Must special storage procedures be taken?

Uranium metal (except form) can be handled and stored with methods similar to those used with any other metal. From, however, not flammable and should be stored under oil or water.

Is Commercial Uranium expensive?

Yes, it is. For example, in lots of 100 pounds or more, Davison Uranium is priced at just \$4.00 per pound—considerably cheaper than other heavy metals, with the advantage of superior strength.

Want more information?

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Meteoroid Danger May Be Overestimated

By Fred Clark

London—Metal skins of spacecraft are not 100 times as long as previously supposed because the mitrating effect of meteoroids striking at very high velocities has been overestimated. R. J. Park of Royal Corp. told the 10th International Astronautical Congress here.

When a particle strikes a target at certain velocities it causes a cratering effect that does greater total damage than a straight penetration of the target would cause. This effect has been employed as a possible technique for destroying enemy satellites or incoming ballistic missiles. It also has been suggested as a possible hazard on long interplanetary space flights.

Park attempted to calculate the phenomenology of impacts at high velocities, considering even steel and aluminum.

He concluded that some earlier predictions—which in most cases were extrapolations based on relatively low-velocity impact experiments—were far too high.

15,000 mph. Speeds

Experimental data in space on the hypervelocity impact with which he is concerned were meager, Park said, and speeds close to 15,000 mph have been achieved only recently. Ship's calculations agreed with those experiments both as to shape and dimensions of the crater.

Experiments were the firing of an aluminum projectile against an aluminum target at 10,790 fps. in W. W. Adams at the Naval Research Laboratory and the firing of a steel ball bearing into a steel target at 12,000 fps. by W. S. Pennington of the Ordnance Research and Development Co.

British Vehicle

Black Knight propellant rocket launched by a Blue Streak thrust unit would place a 2,000-lb payload into a 500-mi. circular orbit, according to G. K. C. Pardee of de Havilland Propellers, which is contractor for Blue Streak. (AV Sept. 7, p. 24)

Optimum approach to a British vehicle could be provided by this combination, Pardee believes since availability and economy are two of the major factors in any such program for the moment.

Pardee pointed out the commonwealth space flight program has been proposed for satellite control around the Blue Streak intermediate range, ballistic missile, at the launching unit level by their second stage.

Part of solid-propellant rockets hand

in on cutting motor design and capable of putting 1,000 lb into a 500-mi. circular orbit.

Black Knight substantially unaltered and with the same postulated orbit capabilities as the solid second stage.

Black Knight repackaged concept for the propulsion has a capability of putting 2,000 lb into the 500-mi. orbit.

Thruststage solid-propellant rocket fitted to the repackaged Black Knight and giving a deep space capability to the combination.

Most interesting of these design approaches is the third, which would involve a redesign of the Black Knight tankage while keeping the basic propulsion unit intact. Black Knight, designed and built by Saunders-Roe in collaboration with the Royal Aircraft Establishment, itself, has a powerplant consisting of four liquid-propellant rocket motors bearing carbon-graphite nozzles in concentrated hydrogen peroxide. Powerplant development is based on an RAE design and the unit is built in Armstrong Siddeley Motors. Thrust of each motor is 4,000 lb., and the total thrust of 16,000 impulses to 15,000 lb. outside the atmosphere.

Repackaging Method

Using the propulsion has raised the repackaging becomes fairly simple. Existing tankage could be replaced by a pair of hemispherical domes and a transition cylindrical section, Pardee says, with the volume determined by the capability of the Blue Streak thrust unit.

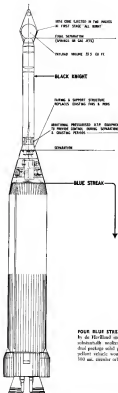
Second stage diameter would be the same as that of the Blue Streak rocket itself.

Instead of the conventional hemispherical separation of tank and oxidizer, Pardee suggests a hemispherical configuration, with the control inhibitor tank containing the oxidizer and the motor tank loaded with peroxide.

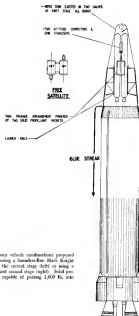
Transition lies between the upper Blue Streak tank and this second stage would contain guidance equipment and would also surround the Black Knight propellant bus. A light firing would cool the nose and the second stage and be jettisoned once the rocket was inside the atmosphere.

Pardee admits of low thrust problem would be repaired for attitude control in space to increase velocity but apart from the nose to the tankage. Sensitive payload would be attached directly to the top of the second stage, the repackaged Black Knight.

The overall height of this two-stage vehicle would not greatly exceed the standard height of the Blue Streak missile and Buckle's existing



SPACE TECHNOLOGY



FOUR BLUE STREAK space vehicle combinations proposed by the Havilland missile using a Saunders-Roe Black Knight substantially unaltered in the second stage left or using a dual package solid propellant second stage (right). Solid propellant vehicle would be capable of putting 1,800 lb. into 500 mi. circular orbit.

DEEP SPACE capability could be obtained using a solid propellant motor fitted as a third stage to a combination Blue Streak and repackaged Black Knight (see drawing on page 104)

Titanium trims DC-8 airframe by 945 pounds

(equals 5 passengers, or 1/2-ton of freight...for life!)

DOUGLAS AIRCRAFT COMPANY, INC.,
Has never built an airplane that failed to show a profit for its operators. Based on the experience of United Air Lines, the first carrier to fly the airplane, the latest Douglas ship, the DC-8 jetliner, indicates it will push this record forward. Here's how use of titanium contributed to the total efficiency of the airplane and what this efficiency means in dollars and cents.

The heavy airframe of the DC-8 jetliner provides its operators a basic economy almost unattainable in current design: pay-back on every flight without reserve or development cost to be amortized. That's how Douglas engineers take the value of titanium in achieving a maximum weight savings structure.

Formerly an aluminum ship, the DC-8 offered few possibilities for weight savings during design. But where weight could be reduced—in pins and pylons, rib doublers and door doublers—titanium was selected—400 pounds of commercially-pure grade Ti-75A for pins and pylons, 330 pounds of Ti-6Al-4V titanium alloy grade for rib doublers and door doublers, 15 pounds of miscellaneous titanium ferrage. Metal is supplied by Titanium Metals Corporation of America.



TITANIUM ALLOYS range in strength which makes them ideal for use in the DC-8. They are used in the fuselage, wing, and tail sections.

TITANIUM ALLOYS are used in the DC-8 for the fuselage, wing, and tail sections. They are used in the fuselage, wing, and tail sections.

The net result is elimination of a half-ton of useless structure weight for the DC-8. This means each DC-8 is expected to make during its service life with all



by 945 pounds

Interpretations of the value of weight savings include:

- **DOUGLAS AIRCRAFT:** "The 945 pounds (net weight) are equivalent to five passengers and their luggage for the entire life of the airplane."
- **UNITED AIR LINES:** "At the very least, the weight saved by titanium is equivalent to a half-ton of cargo. At that rate, the weight amount is a potential of \$375 for each coast-to-coast flight."

Why titanium?

Titanium, with a density of 0.163 lb/in³ is as strong as straight equal to or stronger and as a strength weight basis for resistance to atmospheric corrosion is permanent.

The reliability of titanium has been established with documented flight examples.

- **DOUGLAS** has employed titanium in every commercial transport since its first DC-7, where titanium in fuselage, nacelles and landing gear doors yielded 200 pounds of weight savings.
- **PRATT AND WHITNEY AIRCRAFT** reports that more than one million flight hours have been accumulated by more than 5,000 P & W JT-3 and JT-4 engines on jet transport components without a single failure of any titanium part, either through corrosion or fatigue of design. Both engines have been specified for the DC-8.
- **Adopting to titanium's reliability in its "designer property,"** W. Stuart Lyman, Principal Metallurgist, Titanium Metals Corp., Irvine, made this statement in a lecture in Los Angeles March 18:

"We have talked with metallurgists from three large units of titanium recently. To me, they reported that titanium poses nothing important, just fabricated, passed final inspection, and gets assembled into the airplane, it is usually never heard from again."

Is titanium competitive in price?

RYAN AERONAUTICAL CORP., which fabricates the bulk of the titanium assembly employed in the DC-8, comments indirectly, while saying for its staff of craftsmen and the titanium is used in large quantities. For example, the passenger entrance door, Ryan's DC-8 first assembly building at San Diego has been so constructed that no doors or windows open in the direction of prevailing winds.

While acknowledging no opportunity to improve upon employer's funds that titanium metal costs more than steel, Ryan has developed manufacturing techniques to fabricate titanium at prices roughly equivalent to steel. The spend between "major metal" and completed assemblies is thus drastically reduced since fabrication costs are, of necessity, far greater than raw material costs.

Highlighting titanium's fabricability is Ryan's production of the nose panel which covers the DC-8 cockpit. Three panels—usually the door through which engine will be serviced for life—are made from three sections of 6,816" by 71-1/2", 36" by 72", and 36" by 72" and welded together to form the skin of the completed door. Details, such as stringers, cleats, ribs and frames, are then welded or riveted to the skin. The completed product weighs 80 pounds and measures 162" long by 76" in the cockpit. Control of tolerance (manufacturing tolerances are ±0.001") is so tightly developed at Ryan that these dimensioning nose panels are interchangeable with any past built for a specific airline.

TITANIUM ALLOYS range in strength which makes them ideal for use in the DC-8. They are used in the fuselage, wing, and tail sections.



Where does titanium belong?

Titanium metal, built into the DC-8 is a basic design material, but has also been a variety of engine and military applications in a direct volume low-volume characteristics for better materials to capture weight savings sufficient to permit improvements in speed or payload capacity.

Although much weight reduction programs and the standard dollar value must be viewed in relation to the specific application, titanium's potential resistance to atmospheric corrosion yields dividends immediately apparent to operators of commercial carriers. It means 8 to 10 quadrillion hours operation each year when maintenance means not only repair costs, but also down time of expensive equipment.

In pins, pylons, landing gear doors, bulkheads, struts, and a host of similar parts, titanium's weight savings are measured in pounds. In propellers such as solid and liquid propelled turbines, titanium's weight savings are measured in pounds.

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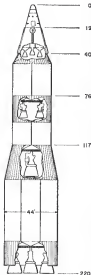
This metal is available in TMC's genuine efforts to meet your delivery schedule, to provide you with whatever information you need concerning properties of titanium and monometallic of titanium metal, and to put you in your present advantage through TMC's technological progress.

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MAIA HEVA described at meeting differed slightly from previous configurations

boozers for the missile could also be used for the attitude motor.

First stage guidance would use inertial and Blue Streak equipment, autopilot control of the second stage would be used to make the orbit, with either a small inertial system or a radio one would take optional if available at the time.

Probes are that of a diagnostic probe looked inside it should be, look up, to fit a third stage solid propellant rocket to the top of the repackaged Black Knight and extend the capability at the overall vehicle.

Proposal for the solid propellant second stage is primarily a three stage

scheme. Probes employed a small jet provide the optimum performance of a properly matched second stage design. But by using solid propellant rockets now under development gives a Blue Streak with considerable improvement in volume change-rate surface capability could be selected for Britain.

Using the unmodified Black Knight is a good idea for quick capability. Probes suggests but he adds that it falls short of being properly matched in its present form. Black Knight is too small and light to match the launching capability of Blue Streak. Greater loads caused by the long thin Black Knight second stage might force redesign of the Blue Streak nose and would certainly introduce new problems due to wind shear at launching. Probes says that even changing new with other proven components or ones already under development would not produce results as much under two to three years. He emphasized that his entire concept could be lived on work already done by the missile and the rocket vehicle and that changes would be at a minimum.

Two new and new version-potential.

Personal Equipment Development

London-Col. John P. Stapp, chief of Air Research and Development Command's Aerospace Medical Laboratory cited these examples of new developments in personal equipment for space flight at the 19th International Astronautical Congress.

• Fusion device will be the next step in generating electricity for subjects under zero-gravity conditions. Stapp did not elaborate, but specified that the device is a beta shift now being used to replace vapors in clothing. Cited a couple of large numbers of non-mechanical loads and even, before flight under slight pressure is selected in pure oxygen but not under clean loads.

• Thin-walled, water-filled suit being between the subject and a laminating, sealed body shell is expected to provide almost the same degree of protection against gravitational forces as that given by complete vacuumation of the subject in space.

Stapp also reported three hypersonic effects during extended periods of zero-gravity flight.

• Considerable nausea and vertigo is produced when a free-falling subject turns over suddenly. One such case being roughly equivalent to about 15 g in a normal turn. If the subject wears his head gently and slowly, this sensation can be avoided.



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expected as related with "bottle-neck" effects.

Among the payloads was one for a detector experiment in relation to the human in space, an experiment which the scientist can be thought of better to consider which are flown in military or research programs in small weight and volume payloads and at the modest cost (for one half of the experiment) of \$150.

This would be a relatively large task as it were by atomic plant used as to measure exposure while working. The other half would be nuclear analysis plates capable of identifying the cosmic particle and measuring and recording its energy level as well.

Missile Experiments

Another experiment which she urged be started as soon as possible was one measuring ballistic missile vehicle components, in the consideration in all these cases, the noise levels and related vibrations. These, she said, could be incorporated for a 25 to 30, 20 or in volume and two telemetry channels, recorder and power supply. On a separate telemetry transmitter could be provided for additional 5 Hz and 500 or in volume.

Still another effort which she urged was consideration of simple instruments how to measure parameters on which to base the values which would cause automatic reaction of the pilot capsule on a space vehicle.

Here she recommended that engine component temperature be a primary data, the turbine (the turbo-prop) speed be monitored and rocket engine thrust chamber pressure. Turbine, fuel system could be covered which are set to achieve values which would be checked in valid for activation of automatic reaction system. Each time a value is recorded the switch is closed and signal recorded. Gathered on a number of light data would indicate whether values were consistently being recorded, whether values were of the right order, plus other statistical as parts.

Other experiments recommended were investigation of behavior of liquids and liquid-gas mixtures under conditions of weightlessness.

Three-Man Capsule

Development of a three-man space capsule was outlined by Sgt. L. John J. R. Bouslog, Royal Air Force, as a change officer who is heading this particular project at the new station design section of the research laboratories, Wright Aeronautical Development Center.

Bouslog pointed out that preliminary space flight would encompass such things as changing the orbital cycle, complete cross training of all

crew members so that one man would be on duty at all times capable of handling the mission.

Associations with Bouslog said that a vertical launch would be made of a sub-orbital vehicle which would make a 30-day orbit and have a fairly high lift available at the actual re-entry phase.

Another aspect Bouslog said, was that there would be for the space item, "an action or reaction" during the flight.

After pointing out that preliminary would be accomplished, then the flight, the squadron leader indicated that it probably will require scheduling again

for the space crew to return to normal earth living conditions.

Considered as a 300 to 4 ft volume cabin for the crew, 75 to 100 diameter. Personnel would have to be made for such things as clothing changes, in all along to control food water and oxygen requirements. There would be no storage provision in the conventional sense for the crew, Bouslog said.

Challenging command would be a lightweight flight suit with integral shoes incorporating special absorption pads under soles and in the cockpit. Food required would be in the order of 12.5 lb per man per day.

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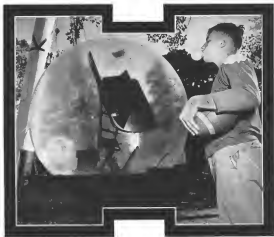
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2. **Mobility**—Hughes engineers "ruggedized" and miniaturized the system so that it could be mounted onto standard army trucks which could be deployed in most almost any combat problem—even in rugged terrain.
3. **Reliability**—By using digital data transmitting techniques, Hughes engineers have greatly reduced any possibility of error.

Result: the most advanced electronics defense system in operation!



Falcon air-to-air guided missiles, shown in an environmental photo-chamber are being developed and manufactured by Hughes engineers in Torrance, Arizona.

Reliability of the advanced Hughes systems can be insured only with the equally advanced test equipment designed by Hughes El Segundo engineers.



Other Hughes projects provide similarly stimulating outlets for creative talents. Current areas of Research and Development include advanced airborne electronics systems, advanced data processing systems, electronic display systems, molecular electronics, space vehicles, nuclear electronics, electro-mechanisms, ballistic missiles, and many more. Hughes Products, the commercial activity of Hughes, has announcements open for imaginative engineers to perform research in semiconductor materials and electron tubes.

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the horizontal member track section and an adjustable member track section positioned on the vehicle.

Provision for the vehicle's suspension in the thrust control would be required if the engine would be actuated at full power constantly, and a rotating adjustable column drive would seem to be most desirable. The power plant is oriented at right angles to the vehicle's longitudinal axis.

Vehicle Cabin

Cabin of the vehicle would accommodate one or several persons and instrumentation and would be constructed of lightweight material. There would be a rotating access door in which the passenger sits, while the support arm joints of the chain, seat or couch also would be rotatable. Passengers also would be carried at right angles to the space vehicle's longitudinal axis.

Operation would have the vehicle tracking around the track at various velocities, to achieve the acceleration rates currently achieved by the horizontal space vehicle launchings.

After the proper period of desired acceleration in the horizontal track, the vehicle would transfer into the vertical system of tracks using a combination of thrust control and drive rods to keep the proper velocity, to retain the constant acceleration, then go directly into weightless state which could extend to a maximum of 30 sec. However, should shorter periods of weightlessness be desired, there can be parabolic motion into the vehicle's tunnel around the track.

All items installed in the vehicle, the passengers would feel acceleration forces duplicating those they would encounter in a launch and orbital weightless period of space flight.

Medical Center

The facility would naturally include Barker indicated a required medical and instrumentation system which would gather the data involved, plus the experiments and monitor the vital signs.

With the simulator, true weightless time could be achieved for the time periods specified, acceleration and deceleration could be constant and reproducible, and the cost of operating the facility would be such that much more time at zero gravity could be obtained by actual expenditures of funds compared with an airplane program. Barker said.

In addition, experiments at zero g could be more carefully controlled than they can be in an airplane, plus the fact that the transition from zero gravity conditions to reentry is made smoothly as it would in a real space flight.

Space Medicine Show Planned in Yugoslavia

Advanced space medicine research equipment is displayed by USSR's School of Aviation Medicine, Belgrade Air, at the 1959 International Trade Fair in Zagreb, Yugoslavia.

The school's equipment will be part of a "Man in Space" display at the USSR pavilion at Zagreb. The exhibit is being held under auspices of the U.S. Department of Commerce. The U.S. exhibit probably will be sent to Italy for further display after the Zagreb Trade Fair. The fair ends Sept. 20.

Among key items being shown by the School of Aviation Medicine are:

- Two cable transmitters that use barium in the back of a man's eye. It is designed to determine the physical condition of space-shed beneficiaries in space. Weighing 20 grams, it is fully transmittable and powered by a mercury battery. That has a range of apparent weight loss, but it will be used to transmit minute chemical potentials from the man's body to the located laboratory meters for actual analysis to the ground.

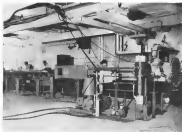
- Top-down bagpack, or life suit, which is designed to reduce time spent in space for three days. It contains a special space suit to limit the man's movements and prevent them being injured during launch and recovery. Pack contains oxygen metering equipment, carbon dioxide, water vapor absorption units and food supply.

- Muscular indicator, used for research into the causes of effects and possible methods of preventing or reducing them. Selection, a critical problem in space flight. The indicator contains five electrodes that fit around the subject's arm. These pick up electrical potentials from the use muscles and relay them to a recorder permitting study of the pattern of use movements associated with various motions.

- Muscular and cardiovascular program to measure oxygen burn in closed environments such as actual biologic space cabins or aircraft capsules. The system uses less than 1/100th of the wattage required by standard oxygen analyzers.

Black Knight Payload Found After Re-Entry

Recent data for Britain's Black Knight rocket vehicle was recently uncovered after penetrating the atmosphere from a height of more than 900 mi. and with re-entry velocity approaching 12,000 ft./sec. Black Knight was shown in a two-day test configuration at the British Air Research Council's new depths at Farnborough. The two-



Grumman Begins Hypersonic Shock Tunnel Tests

Preliminary tests are being made with Grumman Aircraft Engineering Corp.'s new shock tunnel. The 45-ft. long, indirect, indirect shock tunnel is currently producing shock and supersonic conditions comparable to those experienced by a vehicle traveling at Mach 10. Tunnel will be extended to 150 ft. in about five months to produce supersonic shock Mach 20. Air flow duration is less than one millisecond. As a result, these flow rates are compressed before being drawn through normal nozzle in center of tunnel and flow into a flat plate model in test section where plasma is taken through nozzle. Various equipment is in background above, including cooling pump in on left, oil diffusion pump in on right between photo beam was taken 30 ft. away in a longrange, high-speed camera. Shock waves (indicated) and an extremely thick boundary layer are visible.



end stage is a solid fuel test. Analysis of Supply has appointed Mark H. Lightfoot, a mathematician, as new director of Naval Aircraft Establishment at Farnborough. He succeeds Sir George Cardiner, a member of the Black Knight before missile development team, who became controller of aircraft at the Ministry of Supply.

Lightfoot, 41, is one of Britain's leading experts in applied mathematics. His work has been mainly in the fields of fluid dynamics and aerodynamics.

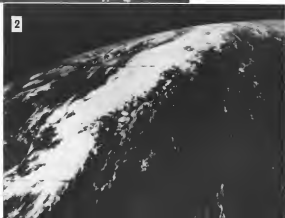
Republic to Analyze Space Probes' Paths

Republic Aviation Corp. will conduct studies to determine the best means for navigating space probes. The company, under a \$102,000 contract awarded by Wright Air Development Center, Contract 48-010 for analysis of data handling methods and guidance requirements for changing the orbit of a vehicle.

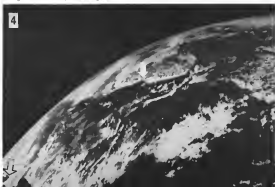


Atlas-GE Nose Cone Photographs Earth

First pictures taken in the U. S. from an altitude of 700 mi. were made recently by a 16 mm. camera housed in a General Electric Mark II nose cone near end of an Air Force-Corpus Atlas ICBM during a down-range firing from the U.S.-G. Missile Test Center, Cape Canaveral, Fla. At left, nose cone of the Atlas (arrow at left of picture) can be seen falling away from the nose cone at an altitude of approximately 200 mi. At right is center of picture point to Florida peninsula and Gulf of Mexico. Picture below taken from an altitude of about 700 mi. shows a large weather front off the U.S. Atlantic Coast. Continental U.S. can be seen on horizon. Down-range flight also marked the first successful operation and recovery of a data capsule used in a reentry vehicle launched by an Atlas. The flight was the second demonstration of stabilizing a space vehicle in three axes during an Atlas trajectory by use of balanced and magnetic sensors and successful methods developed by G.E. Camera began to operate after separation of the reentry vehicle from the nose cone which occurred at approximately 195 sec. after launch.



In picture above, arrows point to Pacific River at extreme lower left, Mississippi in the center and Ohio at the right edge. South and Central America are on the horizon. Photograph below, taken from the peak altitude of about 700 mi., shows tip of Atlas (arrow at lower left) and South America at the center of the horizon. Dark triangular area slightly left of center (smaller arrow) is the Amazon River delta. The Atlas vehicle, designated 16C, traveled at 700 mi. apogee at approximately 18 min. after launch. Film was stopped at apogee as the nose cone began its descent on the 5,180 stat. mi. flight.





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Defense to Expand Oceanographic Study

Washington-Defense Department is expanding its oceanographic program in the fields of materials and oceanography and will place increased emphasis on development of advanced weapon systems for conventional warfare in its Fiscal 1961 budget, according to Dr. Herbert F. York, director of defense research and engineering.

Dr. York, in a speech at the National Press Club, said plans were drafted six months ago to broaden the scope of research and development work, putting particular emphasis on materials and oceanography.

In reply to a query, Dr. York also said that "from an overall point of view" the share of the Defense Department budget going to various missile programs "looks a little excessive."

"There's no one name we'd be willing to drop," he said, but added that "we are paying close attention to the sum total to see if perhaps it has been excessive."

Specifically, York said that, on the part of the three services for development of ballistic missiles, general weapon systems has become "a neglected field." Defense plans he added, "to change this balance somewhat" in the Fiscal 1961 budget.

York said Defense Department also is now making "certain clarifications" in defining the roles, missions and areas of responsibility for the three services.

Regarding the continuing host battle for funds between Army's Nike Hercules point defense anti-aircraft system and the USAF's new Boeing intercept missile, York said the Defense Department wants both systems "in at least the early part of the 1960s," adding that "which one of these is better depends upon what comes the Russians out." He said, however, that the version of the Hercules now available is "not the one we particularly want."

Bell to Develop Storables System

Bell Aircraft Corp. secured USAF contracts totaling \$775,000 for the following projects:

- Development of a storable propellant flow system for rocket engines which would allow storage for an unspecified time of complete rocket engine pack-ups.
- Feasibility study for the electrostatic separation of accelerations as related to a highly classified missile project.
- For a method of determining the effect of structural flexibility on the stability and control of hypersonic aircraft.



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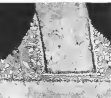
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INFLUENCE of heating time on joint homogeneity is depicted in this photo sequence (top to bottom). Photo above shows honeycomb and board for one minute at a temperature of 1,950°F.

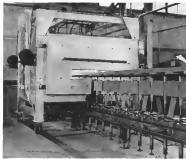


BRAZE FILLET

HONEYCOMB UNIT, heated at 1,950°F for 25 min., under lower filler at base of 0.001 in. thick zone of bonded fillet. Photo has been magnified about 275 times.



MOLECULAR DIFFUSION principle is shown in this photo. Material is Solignum high temperature corrosion resistant alloy alloy developed by Sola Aircraft.



TRAVELING FURNACE put into operation by Sola Aircraft is heating a 16-ft. long wing for section. Furnace moves on tracks at up to 25 ft/min. Temperature with 2,800°F.

Honeycomb May Have Space

By William S. Reed

Sola Diago-Infallible structure strong enough to serve as wing for a light aircraft vehicle, yet light enough to be borne into space as a collapsed state by booster rockets may be built of honeycomb made with an metal length of Sola Aircraft Co. Inc.

One manner in which an inflatable structure could be made would be to collapse the honeycomb core to one size space. At the proper time it could be inflated or mechanically pulled into shape and filled with a plastic foam. The resulting structure would be light, strong and non-reflective as an insulator.

Although inflatable honeycomb is in the idea stage, Sola has built "subsonic" type structures which consist of thin laminated sheets with heating wires between to form a desired pattern. After heating the sheets can be rolled up like a New York City sidewalk and become remarkably stiff when expanded by either gasses or liquid pressure.

Sola stirred out in high temperature metalizing with the production of diamond composites collector rings and pipes.

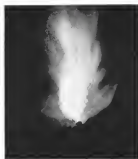
As superconducting magnets produced more and more horsepower, better corrosion products could be used, even turned out by higher temperature alloys. From superconducting engine ac-

tuator parts, Sola progressed to jet engines, orbital cones and trapezes. Now that high temperature structures are necessary for these Mach 2 speeds, the company's past experience in high temperature metalizing parts is in the air frame, manufacturing business.

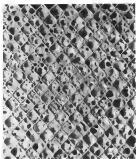
The dividing line between low and high temperature brazing falls between 900°F to 1,000°F separating Inconel and Inco. D. Cresser senior staff metallographer divides brazing operations into three categories—below 900°F, 900°F to 1,300°F and above 1,300°F. Upper limit of brazing temperature for metal alloys comes around 2,000°F, above which only refractory metals can be used. In the medium temperature range (900°F to 1,300°F) the stainless steel honeycomb sandwich structure being manufactured by Sola under subcontract to Convair for the B-70 bomber. One indication of the tremendous cost of superconducting is that one panel about 7 sq. ft. in size costs approximately \$1,100, or roughly \$200 per sq. ft.

An identical panel, when fast produced cost about \$5,000.

Future of stainless steel honeycomb sandwich structure is indicated by its use in the B-70 in comparison with the projected North American B-70 aircraft. In the B-70 (convair 70,000 sq. ft. core half area) in the B-70 (AWA 15, p. 80).



OXYGEN-ACETYLENE flame, at a temperature of 6,000°F, impinges on a refractory, made filled honeycomb structure (left). At right a closeup of 16 in. honeycomb core.



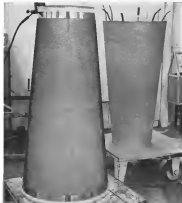
Vehicle Uses

Fabricating large sections of stainless steel honeycomb parts, problems become more complex. Sola under contract to Boeing Aerospace Co. is preparing for work on the B-70 wing. On an experimental basis a "trailing" furnace has been built to heat wing spar webs up to 75 ft. in length by 2 ft. wide. The furnace will handle any shape wing spar up to 74 x 18 in. Lengths greater than 15 ft. can be heated if the supporting end is lengthened.

In operation the part to be heated is placed in a mold or cradle into which is sealed so that no oxygen free atmosphere can be introduced. If shaped bars or bars, spaced one foot apart, support the part and are individually adjusted to align against it of the part. Greater length parts can be accommodated in the furnace by adding more bars and extending the tracks on which the furnace moves.

The furnace, which is electrically heated by up to 72 kw. of power is driven by an electric motor along its track at speeds variable up to 25 ft/min. The four heating elements in the furnace can be adjusted in position carrying the unknowns of heat applied to the part. Following cool-down, the part can be subjected to cold treatment.

Thermal insulation properties of stainless steel honeycomb, of concern when the skin forces walls of integral



PURPLE TEST one core, made of Supremal E 605, is loaded for assembly prior to brazing at 2,800°F in a dry hydrogen atmosphere, one to right is pulled down over structure (left).

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80% chlorine—10% iron—5% silicon—4%, and boron—1%. After leaving the, in powder form, is mixed with a plastic to form a paste. It is then rolled or sprayed into the honeycomb cell paste to joining the facing sheets. Solar was oxidized titanium into which pores are introduced from the bottom. Heat was for having access at the bottom of the furnace is available—heat does not escape so readily when the door is opened, and it is easier to introduce and maintain a hydrogen atmosphere for the facing joints.

Hydrogen atmosphere serves as a flux which dissolves carbon impurities on the metal by gaseous diffusion, ensuring a crystalline clean surface when the metal is heated. Although gases are thoroughly cleaned before entering the furnace, carbon which forms nitrides sticks to the surfaces when they are so moved from and during a weld operation to form. Cracks develop that result from a hydrogen atmosphere providing the proper brazing alloy, a crack will be driven in evident. Solar has produced some brazing alloys under the trade name Goldbraze, and although the company has confidence in their alloy, it will not use alloy specified by a customer.

Refractory coated nuclear engine thrust chambers are also adaptable to high temperature corrosion-resistant brazing methods. These consist of an oral braided thin-walled tubes stacked together to form a certain shaped nozzle. The reason for this method of construction is that fuel is passed through the tightest-like holes in coal

the chamber. After performing the function of exchanging heat from the chamber, the fuel reaction gases are injected into the chamber for combustion. Chambers reach temperatures ranging from 4,500°F to 7,000°F.

Thinner corrosion-resistant refractory coats have been produced which withstand operating environments on the order of 2,100°F. Case material provides support for the refractory oxide material and minimizes spalling, prevents crack propagation and prevents back layers of refractory to be attached to supporting substrates. Flame-retarded carbon design has shown promise for the type of structure. Castable or laminated ceramic materials, braided graphite, dense, nonporous refractory reaction and heat or wear resistant metals such as boron have also are under consideration.

Refractory Coatings

Solar considers refractory coating supported by honeycombs to have applications in nose cone nozzles, rocket engine thrust bearings, jet engines and rocket engine-blend operators.

In operation the honeycomb case near the surface will neck away from between the wall refractory oxide process but do not neck deeper down. As heat eventually erodes the refractory walls, the case will melt further down but the fibers of the case of this type of structure is that it will erode and melt slowly enough so that it will last long enough to serve its purpose. One example would be in jet engines where, although heat and pressure are intense, useful life is only a few minutes.

Brazed woven wire facings have many applications in thrust and static combustion. These porous-fused structures may be used to provide boundary layer bleed, inlet cooling or reduce combustion pressure. Solar has woven unfired wire porous of the open layer of wire about 0.005 in. thick. When heated these multi-layer plates exhibit strength/weight ratio advantages of all-metal honeycombs in addition to saving in fuel or gas wastage.

Harvard, MIT Study High Heat Gases

National Research Foundation has awarded grants to Harvard University and Massachusetts Institute of Technology for research into behavior of gases at high temperatures, bearing on problems of space travel and atomic power.

At Harvard, the program, carried on under a \$300,000 grant will concentrate on re-entry problems, propellant combustion, atomic power and atmospheric studies will be headed by Prof. Howard W. Harnett.

MIT's grant for \$100,000 is to extend studies of electric plasmas which have been under way for several years, according to Dr. William F. Misi. Electric plasmas is a gas made up of atoms from which some electrons have been removed and would have applications in rocket propulsion. Grid studies will center on plasmas produced by microwave, another will be studies of plasmas produced in carbon arcs at high currents.



Test Mating of Explorer VI, Third Stage

Technicians of Space Technology Laboratories, Inc., completed a test mating of the Explorer VI satellite to its third stage solid-propellant motor prior to its scheduled launch (left). Photo shows final safety call-down to launch position (left) and "pushdown" (middle) of the stage. Solid-propellant motor (right) is shown in the background. The satellite is shown in the foreground. The satellite is shown in the foreground. The satellite is shown in the foreground.



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ELECTRONICS—In the half century since the invention of the crystal and on tube by De Forest, the art of electronics has expanded to a fourteen billion dollar industry that is contributing in hundreds of ways to our knowledge of the universe and our understanding of life itself. At Lockheed, for example, over half the technical staff is engaged in electronic research and development.

Significant contributions to the advancement of the state of the art in electronics have been made by Lockheed engineers and scientists in such areas as: computer development, telemetry, radar and data link, transducers and instrumentation, microwave devices, antennas and electromagnetic propagation and radiation, ferrite and MASER research, solid state electronics, including devices, electrochemistry, infrared and optics, and data reduction and analysis.

Over one-fifth of the nation's mobile home telemetering equipment was produced by Lockheed last year. Its FPM/FM miniaturized system provides increased efficiency at one-fourth the weight of FPM/FM mobile home systems.

Advanced development work in high-energy batteries and fuel cells has resulted in a method for converting chemical energy directly into electrical power that promises a fuel utilization of almost 100% and an energy conversion efficiency of 70% or better.

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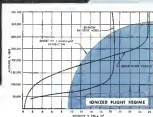
Other major developments are: a digital flight data recorder able to record each of 24 channels every five seconds; digital telemetry conversion equipment to reduce interspersed test data to plotted form rapidly and inexpensively; advancements in the theory of sequential machines; and a high-speed digital plotter that can handle some five thousand points per second with the finished plot programmed into the data tape as a continuous curve.

Lockheed Missiles and Space Division is engaged in all fields of the art—from concept to operation. Its programs reach far into the future and deal with unknown requirements. It is a rewarding future which scientists and engineers of outstanding talent and inspiring mind are invited to share. Write: Research and Development Staff, Dept. 1-2-17, 962 W. El Camino Real, Sunnyvale, California. U.S. citizenship required.

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When man goes into the outer atmosphere, communication with ground installations will be a major problem. The shock wave preceding a hypervelocity vehicle flying at altitudes between 70,000 and 150,000 feet will cause the incoming air to be heated to extremely high temperatures. Result: a sheath of ionized particles around the vehicle.

Communication through the plasma cannot be achieved with conventional equipment. That's why Bendix Systems Division is engineering a communications system in frequency bands specifically designed to penetrate the hypersonic shock layer. The solutions of these problems are known as homogeneous fields and inductive plasma re-entry.

The Readi Systems Division, using the nearby University of Michigan's Ford Nuclear Reactor, is developing radiation-resistant communication equipment to provide extreme reliability over long operating periods. These techniques are applicable to both nuclear-powered vehicles and space stations.

Borden's communications experience is also being applied to other programs for which the Systems Division has management and engineering responsibility—the Navy's EAGLE System and the Air Force's AN/AMQ-10 Weather Reconnaissance System, for example.

Better engineers and scientists are invited to write for further information on Bendix Systems Division.

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General. *Stenobothrus* sp. new. Body length 1.5 mm, pronotum brownish, wings 1.5 mm, antennae 1.5 mm, legs 1.5 mm, head 1.5 mm, thorax 1.5 mm, abdomen 1.5 mm, ovipositor 1.5 mm, male genitalia 1.5 mm, female genitalia 1.5 mm, etc.

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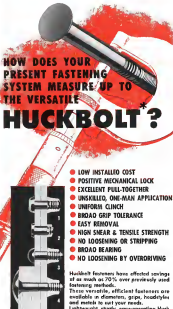
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AVIATION WEEK, September 14, 1999



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AVIATION WEEK, September 14, 1959

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Bendix Systems Division

André Delbecq, *andré@delbecq.com*



House Unit Urges USAF-Army Merger

By Katherine Johnson

Washington—House Government Operations Committee, after seven months of study and hearings on missile management, has recommended merger of the Army and Air Force as the most practical way to improve a defense effort "so large and complex as to be almost unmanageable or at least in peril to be managed by separate organizations."

Continuing criticism of the separation of the two services in 1947, the committee observed "There is historical evidence in the fact that the Air Force achieved its organic separation from the Army, as the President of the defense and of the rise of missile power."

Three major advantages which would follow, as Arms Study suggests the committee said, are:

- Air Force would no longer have to rely on Space Technology Laboratories, a shell-company subsidiary of Thompson Research Worldwide, for technical direction of its ballistic missile program. The Air Force technical capability of the Army and industry could be fully shared.

- "The bitter controversy over missile management will be ended... as defense will get unified emphasis in military planning and budget allocations."

- Advanced Research Projects Agency could be abolished. ARPA functions could be redistributed between National Aeronautics and Space Administration and the unified military services, "reducing civilian-military competition and duplication in space programs."

In addition, the committee noted, the inter-service conflict over missile technical support aviation and other matters will be ended and integrated planning for ballistic missiles as well as strategic missions can be effected.

Costly Competition

Effort spent on "duplicating" roles and resources not duplicated is wasted in view of "the ruthless logic of weapons technology. Whether the formal definitions of their roles and missions, all the services are engaged in a race for missiles and space. The committee declared from the most costly competition now, notably in the area of land-based missiles, is between Army and Air Force, it urged their merger as a first step, saying that leaving the two services, one plus problem at complex, duplication and a complete waste of the defense

organization in later consideration in its 195 page report, compiled by a subcommittee on military affairs headed by Rep. Cliff Hollifield (D-Miss.). The committee requested the President to initiate studies looking to a USAF-Army merger.

The report summarized experiments over the past 10 years in performing missile management.

The report draws a bookkeeping knowledge of directors, committees, special committees, assistant secretaries and other offices and officers working in one way or another to influence the nature and direction of the national missile effort. "There is almost three agencies as an act of imagination and of how administrators to emergencies and to non-military public demands for keeping order out of chaos in the Pentagon. In fact, these agencies that are duplicated by statute in the creation of an inter-service working agreement for stability and permanence, some give rise to new agencies and new forms of organization."

In part, these changes reflect changing needs and circumstances, thus reflect in part the personality and the outlook of office of each new Secretary of Defense.

The committee considered a change in the technical management of the USAF ballistic missile program a "first" and saw two alternatives:

- Space Technology Laboratories, the shell-company subsidiary of Thompson Research Worldwide, is to continue as technical manager it "must be considered into a nonprofit institution."

- "If satisfactory arrangements for nonprofit status cannot be worked out, the alternative is further possible reduction steps is a reversion of the Air Force company to the USAF should have as its principal contractors who have built up technical capabilities in the missile program over recent years, and to Army's Redstone Arsenal which has performed for USAF "only on contract basis."

The military and Dr. Wernher von Braun and his associates should be devoted to new missions in missile or space agencies of federal service mission."

The committee declared that STL's "patented position" is incompatible with its desire for higher profits and vigorous commercial expansion.

Institute of Defense Analysis poses a similar, but less complex, problem with respect to ARPA (AWM Star 25, p. 54). The report said TDA is a nonprofit

organization, but the complex it is to merge to staff ARPA are drawn "usually from large industrial corporations or founded in ARPA's work and interest." ARPA's policy now is not to take persons "on leave of absence," the committee said, but "the possibility that employees might have a standing office to return to former employment was acknowledged."

As for the use of STL's facilities with USAF, TDA-ARPA employees work on the "technical" documents and have the business in contract decisions to the "board" of government employees on ARPA staff. The committee added that "large industrial concerns might benefit in each case and since ARPA discharges the specific companies with whom the military services are in place contracts, the result of industrial service to the committee was called for further investigation of the TDA-ARPA arrangement.

Nonprofit Status

The definition of STL's conversion to nonprofit status was complex. "Public use of STL stock might well result in ownership by people far less concerned with the public welfare than the current owners," the committee said. "Moreover, a publicly held corporation would have to give some response to demands for high dividends and improved financial statements, as well as to the needs of industry which draws its major resources from the government." It recommended that Air Force acquire the facilities of STL to ensure their continuing availability to the government.

The committee urged USAF for failing to build up its in-house technical capability, claiming that Lt. Gen. Bernard Schriever, commander of Air Force Development Command, "admitted" that the in-house capabilities, after five years of missile space program effort, needed to STL, not in the Air Force.

In the personal USAF-STL-Thompson Research Worldwide relationship, the committee declared, "government and private business values have become intermingled to the detriment of both." STL, it said, "casts into the functions of both the government and the private contractor, acquiring power and dividing responsibility to a greater extent in the process." Dismantling on all sides was noted.

- Air Force: The Chief of Staff is a strong noninterference aimed at all non-



Boeing Proposes 12-Man Orbital Station

Model of orbital station proposed by Boeing Aerospace Co. is presently orbiting earth. Shows how various of the station's shell would fold out to solar cells as launch station could collect solar energy to provide power for the station, 100,000 sq. ft. station.

technical achievements of the STL type assigned "an obvious tendency toward increasing corporate responsibility to government." This can only result in the development of a divided authority and noninterference attitude on the part of the service rather than the feeling of direct responsibility for the accomplishment of the assigned task.

Of concern to the Air Force, the committee noted, is the fact that STL is acquiring valuable information it could well acquire as subcontractor. The company not only is privy to data on current programs, but, more important is its future, it participates in the formulation of long-range plans.

- Space Technology Laboratories: STL is present in government activities as granting technical direction, research and related activities. Formerly STL, and its predecessor, Thompson Research, Inc., was only licensed from hardware production. The new USAF policies state that the company is permitted to do and eliminate all other activities.

STL is based on its contract in expanding operations. The committee reported "STL wants more financial stability and independence than it is now getting from the fees on Air Force contracts." STL does not want a large permanent building, but it does want to do more fabrication, have the right to subcontract and free itself from other uncertainties. The company would like to see itself owned by a major business concern.

Space programs, some large, in STL's future in the construction on their services might be used, the committee declared. The financial tax cost, and in a business environment it is too much to expect that the parent and the

Lockheed Aircraft Co., for example, is the primary engineering contractor for a large number of space projects for the USAF and ARPA, but it has no restrictions on subcontracting at hard work production. STL, looks for need to the time, when, in this respect, it will be treated like other subcontractors.

- Thompson Research Worldwide: Although TRW would not like to lose the capabilities and financial potential of STL, the committee said that "any doubts in this respect are probably overcome by its desire to release itself of the business bond."

TRW is based on competing for prime or subcontractors which migrate out of STL's network. James Douglas, chairman of the board of STL, anticipated in testimony to the committee that "the percentage of work TRW is based from building on will grow in the past years, contributing construction would become undesirable." With direction of STL, the committee and there would be on justification and no legal ground for requiring a TRW, and TRW would be free to compete all USAF contracts. So far, TRW has been barred from participating in two subcontracts it wanted for auxiliary power system with Thales Chemical Corp. and for laboratory pressure vessel for the AFSS program of Canada Division of General Dynamics Corp.

Although the top executives of TRW and STL are trying to effect a complete separation of business activities in the construction on their services might be used, the committee declared. The financial tax cost, and in a business environment it is too much to expect that the parent and the

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"... the logistics structure must have the inherent flexibility to respond quickly to the unexpected..."

"... we (USAF) desire to minimize the amount of stock in the system (Spares not only are costly, but become obsolete quickly)..."

quoting from "Solutions to the Spare Parts Problem," by Maj. Gen. Frank A. Rogers, USAF, in the *Logistics* magazine, November, 1956.

1 Emergency Repairs Are Practical

Even at a remote air base, on-the-spot replacement of damaged hose lines is quick and simple when reusable fittings are used. The fittings needed are actually carried on the aircraft. They are the reusable fittings from the old hose lines. Bulk hose and a few simple hand tools are all that are needed to make replacement hose lines that get the aircraft back in the air in minutes.



No special tooling or swaging equipment is required. Only ordinary hand tools, always at hand, are needed to make replacement hose lines of Teflon when reusable fittings are used on original equipment.

2 Reusable Fittings Simplify Logistics



Pictured above are typical hose lines for a single engine installation. Imagine the thousands of different hose lengths and special end fitting configurations used throughout the services. How can the problems of logistics best be solved?

NOT with permanently attached perished-type fittings. Because they make quick field repair of hose lines impossible.

NOT by packing made-up hose lines. For this approach is unnecessarily costly and complicates logistics.

SOLUTION — Aeroquip "super-grip" Reusable Fittings and bulk hose are the perfect solution for hose lines of Teflon and as Aeroquip-designed reusable fittings have become the military standards for rubber hose lines.



3 Reusable Fittings Save Millions of Dollars



These examples show that fittings can be the major portion of hose line cost. When fittings are reusable, hose lines may be repaired using the same fittings. Savings are made each time the fittings are reused, and Aeroquip "super-grip" fittings may be used again and again.

Millions of hose lines of Teflon are now in service and millions more will be added on new equipment in the future.

When replacement is necessary why incur millions of dollars of unnecessary expense by scrapping permanently attached hose fittings?

4 War Experience Proved Reusable Fittings Best

The advantages of the reusable fitting are so important that these fittings were used on the 300,000 U.S. military aircraft built during World War II.

Early in World War II, the 3rd Army Air Corps, by directive, standardized on Aeroquip "super-grip" Reusable Fittings in order to supply the requirements, Aeroquip gave licenses, without compensation, "for the duration" to six competitive companies. This standardization resulted in the familiar AN-9S standards for hose and reusable fittings.

In the event of another national emergency, peacetime standards of supply will be necessary again be overloaded and threatened. The ability to effect prompt repair will be limited by time and availability. In the structure, the reusability concept in hose and fittings will again assist in reducing the number of grounded aircraft and stabilizes, thus having the effect of multiplying the number of operational units at any given moment.

Specify Aeroquip Patented® "super-grip" Reusable Fittings and Aeroquip Hose of Teflon.

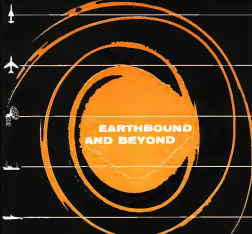


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Layout Facility is in World War II Plug Research-Development-Manufacture

child will eventually work in isolation and to each others' possible disadvantage. The burden of suspicion cannot then be cast aside and certainly the hardened business competition of TRW will not let it be."

Russo-Woodledge Corp. was founded in 1955 by Dr. Simon Russo and Dr. Dean Woodledge, formerly vice presidents of Hughes Aircraft Co., and it was financed by Thompson Products Co. The two scientists' company, which averaged \$6,750 and held 51% of the stock, Thompson Products put up \$161,000 and held 49%.

Selection of Russo-Woodledge for technical management of the USAF ballistics missile program was made by Gen. Schriever, then commander of Ballistic Missile Defense, and presented to a meeting of USAF's Scientific Advisory Committee in October, 1954. It had already been compared by the Taylor-Couper, then special assistant to the secretary of Air Force for research and development, Roger Lewis, then assistant secretary of Air Force and assistant, the commission of Air Research and Development Command (Gen. Thomas S. Power) and Air National Command (Gen. E. W. Ruskhopf, and the Air Staff. It was decided that within USAF staff, was a small committee, in fact they possessed the technical capability to direct the program.

The selection was objected to by Frank Colburn, president of Rand Corp., on the grounds that the arrangement was unworkable because it would tend to separate responsibility and authority in the ballistics missile effort. Colburn's letter of objection was read at the meeting of the Scientific Advisory Committee. The House committee reported "There were several competent contractors," he believed, "who could take on the development program, whereas Russo-Woodledge had no demonstrated competence in the ballistics missile field. Mr. Colburn recommended first Gen. as he left on the Atlas project as project contractor, and that no other contractor be selected to work in competition with Colburn." A three-man panel of Scientific Advisory Committee reported Colburn's memo and "advised the Air Force finding that this role overlapped with Russo-Woodledge and should, at all first, not be logical and should be continued." The committee reported that "the possibility of using the Air Force's missile-launching research was not seriously considered by Gen. Schriever," and commented.

"Consequently, the Air Force might have called upon the Air Force's missile team at Redstone Arsenal to build the intercontinental ballistic missile. In mid-1954, when the ICBM development pattern was being developed, the Air Force probably had more capability

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Minuteman Trailer Delivered to Boeing

Boeing Aircraft Co. has taken delivery of a 70-ft long trailer which will carry only two of the Minuteman intermediate ballistic missile, configuration conforms drawing which last appeared in Aviation Week last Jan. 18 (p. 56). Unit was built by Utah Trailers of Los Angeles, Calif. and is first major Minuteman subcomponent item.

Jet Vibration Monitor

Aurora engine vibration monitor for jet transports consists of a vibration pickup on each engine, a four-channel amplifier and an indicator for the pilot's panel. Four modules will be in an Airbus/Douglas DC-10.

The conventional pickup will measure vibration from 15 to 2,000 cps. Frequency range is from —65 to



+500V, and the unit is hermetically sealed to be unaffected by oil dust or fumes.

The output of each amplifier is connected to an indicator on the pilot's panel. Upon seeing a vibration warning light, the pilot can monitor each engine by means of an engine selector switch. System weight is 16 lb.

Consolidated Systems Corp., 380 Sees Made Villa, Pasadena, Calif.



Radio Rescue Beacon

Radio rescue beacon for military air craft will automatically send distress and homing signals in the event of a crash. Transmitter's 101 signals have been received at distances of 450 mi. continuous in 24 hr.

Transmitters, powered by silver-zinc batteries, send 101 signals on 1,574 mc and 101 signals on 243.6 mc, military guard channel. The beacon can be installed in several locations on the aircraft, and is exposed on each impact by a black powder charge and pin ejected to earth. The 75 lb antenna

was supported by a lithium-filled balloon. Beams will transmit from a land or water surface. The entire unit, including parachute, inflator, transmitter antenna gear and outboard mechanism is packaged in a container 36 in. long x 24 in. in diameter. Total weight is 40 lb.

Crosby Division, Avco Corp., 1325 Arlington St., Canton 26, Ohio.

Cabin Temperature Control

Cabin temperature control system is said to hold cabin temperatures in an earth and space vehicles within two degrees of programmed value. Temperature changes made, when as detected by a thermostat, which transmits signals to the system controller which makes the necessary changes. Air overboard control prevents temperature of air entering cabin from going below 32F to prevent icing in system.

Topp Industries, Inc., 5221 W. 136th St., Los Angeles 45, Calif.



VHF Helicopter Transceiver

Radio, designed for the Hughes Model 369A two-place helicopter weighs 5 1/2 to 4 lb.

The VHF transceiver has a narrow range of 100 mc, can be used at altitude of 500 ft. Transmitter accommodates 25 channels and the receiver covers the General Aviation band 108 to 130 mc. Power output is between 14.7 watts. Model HMA transceiver can focus to FCC Type specifications and is offered to other helicopter users. Navajo Tech. Inc., 1721 Sepulveda Blvd., Manhattan Beach, Calif.

Safe-Arm Initiator

Safe-arm initiator can be used for missile or rocket explosive detector applications or placed in an igniter configuration for solid or liquid propellant test initiation.

Initiator can be wired or detected by means of electrical lines or teleports, is normally designed for contact by



used manually. The use of the 0.5 lb unit is automatic and off detector and explosive components are joined in a fused plane. Arming and firing solenoids can be varied to meet various system requirements. The initiator will operate at 90-105% relative humidity under environmental conditions. Company says.

McCormick Spahn Associates, Hollister Airport, Hollister, Calif.



Turbine Blade Inspector

Optical microscope measures the depth of heat cracks in jet engine turbine blades.

The ACE optical microscope is accurate to within 0.0001 in., and enables maintenance personnel to determine whether the blade can be used or if it will require repair.

Micrometer Division, Air Corp. Equipment Co., 1131 E. Colorado St., Glendale, Calif.

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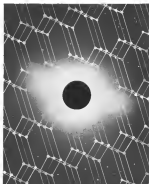
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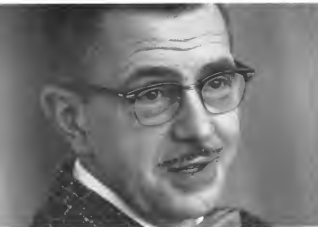
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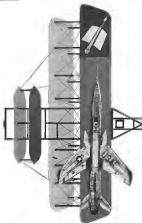
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LETTERS

ACF Divisions

There reported an Aviation Week of Aug. 31 by 201 as one suggesting that ACF Industries is contemplating the sale of its Avion and Nuclear Products-Division.

There is absolutely no hint for the rumor.

We assume that the impression that prompted you to publish your article was from some press and of the fact that ACF is having discussions with a potential partner in the further development of the nuclear product that is neither made by nor related to the business of Avion or Nuclear Products-Division.

ACF Industries will not only continue the legitimate operation of these divisions but is making plans for expansion in these respective product and service fields.

We should greatly appreciate your correction of the impression that we believe our readers will have received from this article.

WILLIAM T. LORAN
Chairman of the Board
ACF Industries, Inc.
New York, N. Y.

Sport of Soaring

I have noticed a few articles about sailing, sailplanes, etc., during the last few months and I would like to congratulate you and compliment you for publishing this kind of thing.

I've read very few publications ever since I was born and it's a good one, but I kept buying that you related plane a lot of airplanes on this wonderful sport of sailing.

I notice that it's not a billion dollar business but I have a bunch that with you and an endorsement of the LFE will develop into the business that is in Germany and Russia.

By Carl, James R. Hirs
Commander
179th Fighter Interceptor Squadron
Marquette Air National Guard
Detroit, Mich.

Clarifying Duties

I am desirous of obtaining clarification of the duties in question which prompted Senor's letter to Quercio (AV, June 25, p. 76). To date I have been unable to get clarification from Senor, as FPA, NAA, and various aviation people I have queried.

The main subject of Senor's letter was the two opposing pilots to remain stopped in their seats.

The main question was: What is a pilotable reason for leaving the cockpit compartment? What was Mr. Quercio's civil and baggage status?

Stripped of all other baggage was the case of Senor's letter and the answer should have been the case of Mr. Quercio's letter. I am unable to find it.

Senor: It will welcome the opinion of an aviator on the same matter in the aviator's editorial column. Address letters to the Editor, Aviation Week, 1300 W. 42nd St., New York 24, N. Y. To be sure to include 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

I consider Mr. Senor's question a fair and valid one, and that Quercio is playing with words when he suggests that a consent of the law was changed and that he is simply relaying the law that has been on the books for many years.

The fact is that the law has been on the books for many years and not a course has been changed, however, something much more important than a course has been changed.

The interpretation of "Duties in non-section with the operation of the airplane" is that when I was flying for an airline some ago the pilot going back into the cockpit to check the passengers' well-being and seeing that everything was correct was not only required by the FAA, but also by the airline.

While admitting that there is no doubt that some pilots taking advantage of this in good faith in the future, to whatever extent there can be no doubt that Mr. Quercio no longer considers valid reason for a pilot going into the cockpit that was considered valid in the past. That is a new way of looking at things, perhaps pointed but never explained or even admitted by Quercio. That is not helpful.

Some pilots concerned when a public servant wishes to explain in interpretation, so as this one or his means together with substantial evidence in words his proposed law.

Regardless of how good the words may be in effect the intention provides a more detailed.

I think most of us in America would agree that regardless of good words, dishonesty is a very bad word. It is dishonest that someone pretends not to know that he is not willing to put the price at whatever the company has when.

The law concerning pilot remaining in their seats has been extended to CAC, to the extent that it is a law that is not made without sufficient thought for it is apparent that in order to be of use to the law, a new law must be made.

We require a Super Venturi under point 4 of the CAC which does not require a request.

The law allows us to fly this plane with but one crew member, the pilot (CG always use a cockpit). However, if we put an additional crew on the plane which automatically increases the safety in landing, a cockpit is now a required crew member for every aircraft.

Since the standard is extended to the pilot's broken rule, the cockpit rule operates the broken directly without going through the cockpit.

Therefore, the cockpit is required to

that if the destination malfunctions ground landing will be available in the cockpit position. But even then it is a required crew member to come under the law requiring pilot to remain stopped in that seat.

There is considerable confusion as to when he can exit the cabin although with out the destination he doesn't have to be around the plane at all, or if he is he can spend all his time in the cockpit if he wishes.

However, if he remains around the cockpit he is making decisions as to whether he should stay in the cockpit or not, and this is a decision which the cockpit rule is intended to prevent.

There is considerable confusion among FAA agents as to whether anyone could be considered under present interpretation as "detour in connection with the operation of the airplane."

Some say it comes under the category is really in going to the toilet does Officer so.

We have the option of operating at a light but low level level than we wish (no destination and crew as captain), as operating at a much higher level level than the law requires but then having the cockpit hampered in his duties by a law which doesn't recognize the need for him except with destination on the plane, and the pilot must be first in his general operation not crossing flight.

When I take this down on head space and I get the feeling of being passed through the landing gear with Alex and my son in Woodbridge.

How do you feel?

As far as putting me letters, I certainly would like them put in the column, if possible, for it shows some of the things we are going to do and the other side is forced.

I notice this was my suggestion:

Chairman
Chief Pilot
Crest Flight & Co., Inc.
White Plains, N. Y.

Jet Training

Capt. Robson wrote at Aug. 19, 1959 in his letter that I am a pilot, even somewhat diverse view on flight training problem.

In 1956 (AV, Dec. 1, p. 124) I was among the leaders who discussed with other officers on an international flight training and its close to the ground aspect, which, however, I agree with the current Cockpit Viewpoint which question is whether the particular case is worth the cost.

The question would apply to airports to go, but probably more to go where there is an opportunity to recover from training error.

Unluckily, both types have taken a toll in men and machines.

Some of it has been from non-accidents. I am sure it is true.

Stanley E. Tatum
Washington, D. C.



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